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PEDCo-Environmental, Inc, Cincinnati, OH

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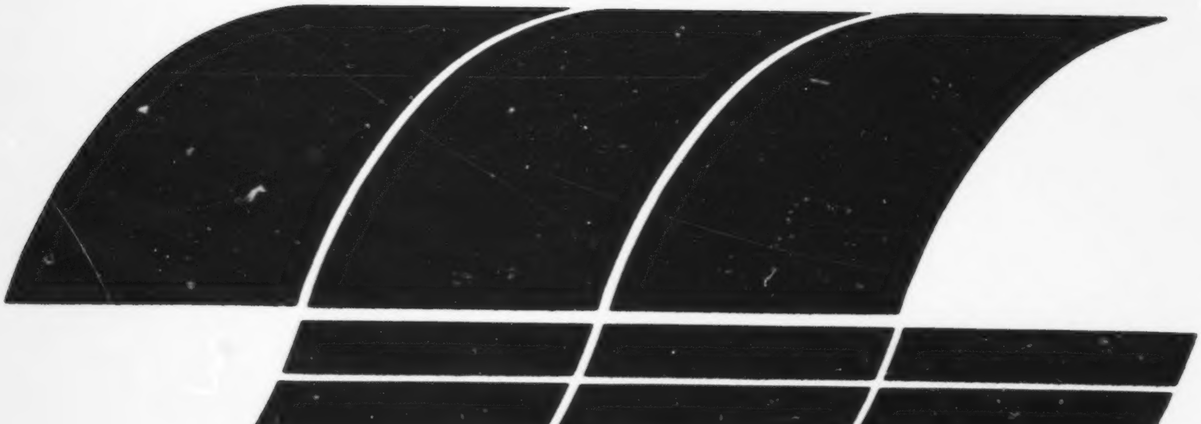

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16. ABSTRACT The report is the second in a series of four generated by a new computerized data base system. Because the three succeeding issues are supplements, the first should be retained for reference throughout the year. The report differs from the previous series in that the scope of design data for operating FGD systems is vastly expanded, section formats are revised, and a new section includes operating particulate scrubbers. The report surveys utility FGD systems in the U.S. It summarizes information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms. Systems are tabulated alphabetically by development status (operating, under construction, or in planning stages), utility company, process supplier, process, waste disposal practice, and regulatory class. It presents data on system design, fuel sulfur content, operating history, and actual performance. It includes unit by unit dependability parameters and discusses problems and solutions associated with the boilers and FGD systems. Process flow diagrams and FGD system economic data are appended. Current data shows 51 units operating FGD systems, 42 systems under construction, and 69 planned units with gross generating capacities of approximately 19,170, 17,377, and 40,115, respectively. Total controlled capacity for 1988 is expected to be 76,000-plus MW.

17. KEY WORDS AND DOCUMENT ANALYSIS

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Waste Disposal			15E
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NOTICE

This report, (prepared by PEDCo Environmental, Inc., Cincinnati, Ohio, under EPA Contract No. 68-02-2603, Task No. 48) is provided as an information transfer document. Data in this report are supplied voluntarily by utility representatives; flue gas desulfurization (FGD) system designers, and suppliers; regulatory personnel; and others. Neither EPA nor the designated contractor warrants the accuracy or completeness of information contained in this report.

This report is the first of three supplementary issues to the December 1978 - January 1979 report. Supplementary issues are cumulative, so that it is necessary to retain only the latest issue and the December 1978 - January 1979 report (EPA-600/7-79-022c).

Initial distribution of the report (generally, one copy per company) is limited to organizations and individuals indicating a specific interest in the field of FGD technology. Additional copies of this report and succeeding issues can be purchased from National Technical Information Service, Springfield, Virginia 22151.

CONTENTS

Page

Notice ii
Tables vi
Executive Summary and Highlights vii

Section 1 Summary List of FGD Systems 1

Section 2 Status of FGD Systems 6

Section 3 Design and Performance Data for Operational FGD Systems 34

Alabama Electric

Tombigbee 2 34

Allegheny Power System

Pleasants 1 35

Arizona Electric Power

Apache 2 37

Arizona Public Service

Cholla 1 38
Cholla 2 40

Central Illinois Light

Duck Creek 1 41

Columbus and Southern Ohio Electric

Conesville 5 43
Conesville 6 45

Duquesne Light

Elrama 1-4 46
Phillips 1-6 47

Gulf Power

Scholz 1,2 48

Indianapolis Power and Light

Petersburg 3 49

Kansas City Power and Light

Hawthorn 3 51
Hawthorn 4 52
LaCygne 1 53

Kansas Power and Light

Jeffrey 1 55
Lawrence 4 56
Lawrence 5 57

Kentucky Utilities

Green River 1-3 58

CONTENTS (continued)

Page

Louisville Gas and Electric

Cane Run 4 59
Cane Run 5 60
Cane Run 6 61
Mill Creek 3 63
Paddy's Run 6 64

Minnkota Power Cooperative

Milton R. Young 2 65

Montana Power

Colstrip 1 66
Colstrip 2 67

Nevada Power

Reid Gardner 1 68
Reid Gardner 2 69
Reid Gardner 3 70

Northern Indiana Public Service

Dean H. Mitchell 11 71

Northern States Power

Sherburne 1 72
Sherburne 2 74

Pennsylvania Power

Bruce Mansfield 1 76
Bruce Mansfield 2 77

Philadelphia Electric

Eddystone 1A 78

Public Service Company of New Mexico

San Juan 1 79
San Juan 2 80

Southern Carolina Public Service Authority

Winyah 2 81

Southern Indiana Gas and Electric

A.B. Brown 1 82

Southern Mississippi Electric

R.D. Morrow 1 84

Springfield City Utilities

Southwest 1 85

Tennessee Valley Authority

Shawnee 10A 87
Shawnee 10B 88
Widows Creek 8 90

Texas Utilities

Martin Lake 1 91
Martin Lake 2 92
Martin Lake 3 93
Monticello 3 95

Utah Power and Light

Hunter 1 96
Huntington 1 9[illegible]

CONTENTS (continued)

Page

Section 4 Summary of FGD Systems by Company 99

Section 5 Summary of FGD Systems by System Supplier 101

Section 6 Summary of FGD Systems by Process 103

Section 7 Summary of Operating FGD Systems by Process and Unit 104

Section 8 Summary of End-Product Disposal Practices for Operational FGD Systems 106

Section 9 Summary of FGD Systems in Operation 108

Section 10 Summary of FGD Systems Under Construction 111

Section 11 Summary of Contract Awarded FGD Systems 113

Section 12 Summary of Planned FGD Systems 114

Section 13 Total FGD Units and Capacity (MW) Installed by Year 117

Section 14 Design and Performance Data for Operational Particulate Scrubbers 118

Appendix A FGD System Cost Data: Operational and Nonoperational Systems
  A-1 Major FGD System Equipment Summary A-7
  A-2 Cost Element Factors A-12
  A-3 Description of Cost A-15
  A-4 Categorical Results of Reported and Adjusted Capital and Annual Costs for Operational FGD Systems A-18
  A-5 Costs for Operational FGD Systems A-19
  A-6 Costs for Nonoperational FGD Systems A-23

Appendix B FGD Process Flow Diagrams B-1

Appendix C Definitions C-1

Appendix D Glossary of Units D-1

TABLES

No.		Page
I	Number and Total Capacity of FGD Systems	vii
II	Summary of Changes, February-March 1979	ix
III	Performance of Operational Units, February-March 1979	x

EXECUTIVE SUMMARY

This report has been prepared every other month by PEDCo Environmental, Inc., under contract to the Industrial Environmental Research Laboratory/Research Triangle Park and the Division of Stationary Source Enforcement of the U.S. Environmental Protection Agency. After this issue, reports will be issued quarterly (every three months.) This is the second issue generated by a new computerized data base system, the structure of which is illustrated in Figure 1.

Table 1 summarizes the status of FGD systems in the United States at the end of March 1979. Table II lists the units that have changed status during February - March 1979, and Table III shows the performance of operating units during this period.

TABLE I. NUMBER AND TOTAL CAPACITY OF FGD SYSTEMS

Status	No. of Units	Total Controlled Capacity, MW*	Equivalent Scrubbed Capacity, MW†
Operational	51	19,170	17,822
Under construction	42	17,357	15,763
Planned:			
Contract awarded	20	11,093	10,517
Letter of intent	2	1,100	1,100
Requesting/evaluating bids	13	9,998	9,110
Considering only FGD systems	34	17,944	17,174
TOTAL	162	76,662	71,486

* Total Controlled Capacity (TCC) is the summation of the gross unit capacities (MW) brought into compliance with FGD systems regardless of the percent of the flue gas scrubbed by the FGD system(s).

† Equivalent Scrubbed Capacity (ESC) is the summation of the effective scrubbed flue gas in equivalent MW based on the percent of the flue gas scrubbed by the FGD system(s).

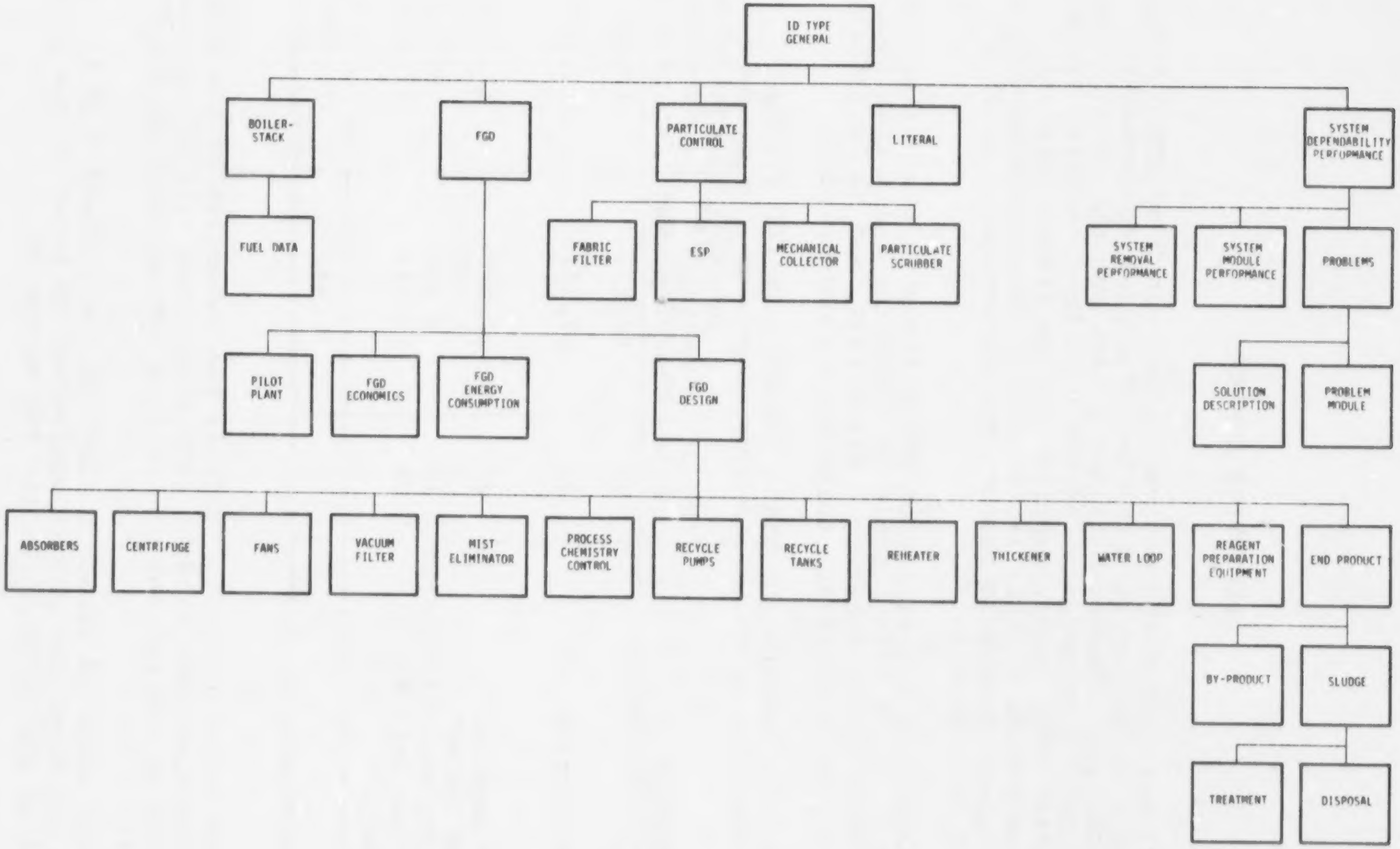
ID TYPE GENERAL
BOILER-STACK
FUEL DATA
FGD
PARTICULATE CONTROL
LITERAL
SYSTEM DEPENDABILITY PERFORMANCE
FABRIC FILTER
ESP
MECHANICAL COLLECTOR
PARTICULATE SCRUBBER
SYSTEM REMOVAL PERFORMANCE
SYSTEM MODULE PERFORMANCE
PROBLEMS
PILOT PLANT
FGD ECONOMICS
FGD ENERGY CONSUMPTION
FGD DESIGN
SOLUTION DESCRIPTION
PROBLEM MODULE
ABSORBERS
CENTRIFUGE
FANS
VACUUM FILTER
MIST ELIMINATOR
PROCESS CHEMISTRY CONTROL
RECYCLE PUMPS
RECYCLE TANKS
REHEATER
THICKENER
WATER LOOP
REAGENT PREPARATION EQUIPMENT
END PRODUCT
BY-PRODUCT
SLUDGE
TREATMENT
DISPOSAL

Figure 1. Computerized data base structure diagram.

TABLE II. SUMMARY OF CHANGES: FGD SUMMARY REPORT, FEBRUARY-MARCH 1979

FGD status report	Operational		Under construction		Contract awarded		Letter of intent		Requesting/ eval. bids		Considering FGD		Total	
	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*	No.	MW*
11/31/79**	46	15,795	45	16,976	21	11,051	2	1100	11	8268	33	17,014	158	70,204
Allegheny Power System Pleasants 1	+1	519	-1	519										
Louisville Gas & Electric Cane Run 6	+1	288	-1	288										
Muscatine Power & Water Muscatine 9											+1	160	+1	160
Northern Indiana Public Service Schahfer 17									+1	421			+1	421
Northern Indiana Public Service Schahfer 18									+1	421			+1	421
Public Service of New Mexico San Juan 3			+1	534	-1	534								
South Carolina Public Service Winyah 3			+1	280	-1	280								
South Carolina Public Service Winyah 4					+1	280							+1	280
Southern Indiana Gas & Elec. A.B. Brown 1	+1	265	-1	265										
Texas Utilities Martin Lake 3	+1	595	-1	595										
Utah Power & Light Hunter 1	+1	360	-1	360										
TOTAL	51	17,822	42	15,763	20	10,517	2	1100	13	9110	34	17,174	162	71,486

* Equivalent scrubbed capacity.

** The totals as of 1/31/79 shown have been modified as a result of corrections of MW ratings reported by utilities.

TABLE III. PERFORMANCE OF OPERATIONAL UNITS
FEBRUARY 1979 - MARCH 1979

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD capacity on line during period, MW[a],[b]	No information for this period, MW	Shut down throughout period, MW	FGD system availability, %[c]		FGD system operability, %[c]		FGD system reliability, %[c]		FGD system utilization, %[c]	
						Feb.	Mar.	Feb.	Mar.	Feb.	Mar.	Feb.	Mar.
Tombigbee 2	179	70	179			95	95						
Pleasants 1	519	84	519										
Apache 2	195	100	195										
Cholla 1	119	100	119					100	98	100	98	100	98
Cholla 2	350	100	350										
Duck Creek 1	416	100	416										
Conesville 5	411	100	411			0	25	0	25	0	25	0	22
Conesville 6	411	100	411			0	38	0	33	0	34	0	29
Elrama 1-4	510	100		510									
Phillips	410	100		410									
Scholz 1,2	23	N/A[d]	23				100	98	100		100	98	100
Petersburg 3	532	100	532									39[e]	39[e]
Hawthorn 3	90	100	90										
Hawthorn 4	90	100	90										
LaCygne 1	874	100	874			94	95						
Jeffrey 1	540	75	540										
Lawrence 4	125	100	125										
Lawrence 5	420	100	420										
Green Rivers 1-3	64	100	64				11		100		100	0	11
Cane Run 4	188	100			188	100	100						
Cane Run 5	190	100	190			71			72	46	67	50	58
Cane Run 6	288	100	288										
Mill Creek 3	442	100	442					18	53			17	52
Paddy's Run 6	72	100			72								
Milton R. Young 2	405	85		405									
Colstrip 1	360	100	360										
Colstrip 2	360	100	360										
Reid Gardner 1	125	100	125			86	98	86	97	86	97	86	78
Reid Gardner 2	125	100	125			97	98	93	97	93	97	88	90
Reid Gardner 3	125	100	125			41	100	46	98	46	100	41	68
Dean H. Mitchell 11	115	100	115			7	47			1	44	1	43
Sherburne 1	740	100	740			89	92						
Sherburne 2	740	100	740			93	91						

(continued)

TABLE III. (continued)

Plant	FGD system capacity, MW[a]	Flue gas % scrubbed	FGD capacity on line during period, MW[a,b]	No information for this period, MW	Shut down throughout period, MW	FGD system availability, %[c]		FGD system operability, %[c]		FGD system reliability, %[c]		FGD system utilization, %[c]	
						Feb.	Mar.	Feb.	Mar.	Feb.	Mar.	Feb.	Mar.
Bruce Mansfield 1	917	100	917										
Bruce Mansfield 2	917	100		917									
Eddystone 1A	120	N/A[d]		120									
San Jaun 1	361	100	361										
San Juan 2	350	100	350										
Winyah 2	140	50	140			97[f]	97[f]	96[f]	96[f]	96[f]	96[f]	93[f]	93[f]
A.B. Brown 1	265		265										
R.D. Morrow 1	124	62	124										
Southwest 1	194	100	194			25	59	16	27	16	27	12	26
Shawnee 10A	10	N/A[d]	10										
Shawnee 10B	10	N/A[d]	10										
Widows Creek 8	550	100	550										
Martin Lake 1	595	75	595										
Martin Lake 2	595	75	595										
Martin Lake 3	595	75	595										
Monticello 3	800	100	800										
Hunter 1	360				360								
Huntington 1	366	85		366									
TOTAL	17,822		14,474	2728	620								

[a] Equivalent scrubber capacity.

[b] This category includes the flue gas capacity being handled by the FGD system at least part of the time during the report period.

[c] The percent figures listed are average values for all system scrubbing trains during the period.

[d] Flue gas % scrubbed for prototype and demonstration units is not applicable unless the system is designed to bring a unit into compliance with SO_2 emission standards.

[e] This figure represents the average utilization from September 1978 through December 1978.

[f] The figures represent averages for February through March.

As indicated in Table I, 51 power generating units (all coal-fired) are now equipped with operating FGD systems. These units represent a total controlled capacity of 19,170 MW. Projections indicate that the total power generating capacity of the U.S. electric utility industry will be approximately 878 GW by 1988.[a] (This value reflects the annual loss resulting from the retirement of older units, which is considered to be 0.4% of the average generating capacity at the end of each year.) Approximately 395 GW[a,b,c] or 45% of the 1988 total will come from coal-fired units. Of the 162 FGD-equipped units (76,662 MW) shown in Table I, 160 (76,072 MW) are scheduled for operation by 1988. Therefore, approximately 19% of the projected coal-fired capacity will be controlled by FGD by the end of 1988.

HIGHLIGHTS: FEBRUARY - MARCH 1979

The following paragraphs highlight FGD system developments during February and March 1979.

Pleasants 1 of Allegheny Power System began operations in March 1979. Performance figures for the four-module lime slurry FGD system are not yet available as the unit is undergoing shakedown/debugging operations. Allegheny Power did report that some operational problems occurred during the period.

Arizona Public Service reported that the Cholla 1 FGD system remained in service during most of the report period. The FGD system's average reliability for February and March was 100 and 98%, respectively. The boiler was in service 672 hours in February and 727 hours in March.

The Thoroughbred 121 prototype FGD system retrofitted on Gulf Power's Scholz Units 1 and 2 achieved operabilities of 98 and 100% during February and March, respectively. The Thoroughbred 121 facility removes SO_2 and flyash from an effective 23 MW capacity slip stream drawn from the two 47 MW (gross) Scholz units. Chiyoda International, the system supplier, reported that removal efficiencies for SO_2 have ranged from 93 to 95%.

Kansas City Power and Light reported that the LaCygne 1 FGD system was in service during the report period, achieving average system availabilities of 94 and 95% for the months of February and March, respectively. Unit power production was limited by a number of boiler-related outages during the period, resulting in unit service times of 342 hours for February and 314 hours for March.

Cane Run 6 of Louisville Gas and Electric (LG&E) began operations in March 1979 with the boiler logging 475 hours and the FGD system, 237 hours in April 1979. This first full scale utility dual alkali FGD system uses a carbide lime slurry circulated through two parallel scrubbing trains to remove SO_2 from the flue gas generated by the 288 MW (gross) steam generator.

Muscatine Power and Water announced plans to install an FGD system at Muscatine Power Station. The plans call for a lime or limestone slurry type FGD system to clean flue gas generated by Muscatine 9, which is scheduled to begin operations in 1982. Particulate matter will be controlled with an ESP and SO_2 with two 100% capacity FGD modules. The design will include a forced oxidation system to produce a sludge product suitable for landfill after drying, and an indirect steam coil type flue gas reheat system.

Nevada Power reported that the FGD systems for Reid Gardner 1, 2, and 3 were in service during most of February and March. FGD system availabilities for February were 86% for Reid Gardner 1 and 97% for Reid Gardner 2 (Unit 3 experienced FGD system related outages that yielded low February availability). FGD system availabilities for March were 98, 98, and 100% for Units 1, 2, and 3, respectively.

Northern Indiana Public Service Company (NIPSCO) is requesting/evaluating bids for the installation of FGD systems on Schahfer 17 and 18. The new Schahfer units will be rated at 421 MW (gross) each. Particulate matter will be controlled with cold-side ESP's. NIPSCO is considering a sodium based FGD system for SO_2 control; however, no specific process has been selected. Schahfer 17 and 18 are scheduled to begin operations in June 1983 and June 1985, respectively.

Northern States Power reported that the FGD system availability for Sherburne 1 was 89% in both February and March and that the FGD system availability for Sherburne 2 was 93% in February and 91% in March.

Public Service Company of New Mexico reported that construction of San Juan 3 is nearing completion. The 534 MW unit is scheduled to begin operations in June, 1979, with a Wellman Lord FGD system controlling SO_2 emissions.

Winyah 2 of South Carolina Public Service achieved a combined FGD system availability of 97% for both February and March. The boiler operated 1362 hours during the two month period and the FGD system operated 1313 hours.

South Carolina Public Service reported that a contract was awarded for an FGD system planned for Winyah 4, a new 280 MW (gross) coal-fired unit scheduled for start up in May, 1981. The utility will equip the unit with an ESP for particulate matter control and a two-spray tower limestone slurry FGD system for SO_2 control. Winyah 3 is now under construction and is expected to begin operations in May, 1980.

A.B. Brown 1 of Southern Indiana Gas and Electric began operations in March, 1979. The 265 MW (gross) unit uses a cold-side ESP for particulate matter control and a two-scrubber train dual-alkali FGD system for the control of SO_2. The FGD system can operate in a closed or open loop and uses cooling tower blowdown for makeup water.

Martin Lake 3 of Texas Utilities became operational in March 1979. The 750 MW (gross) unit uses a limestone slurry FGD system for SO_2 control and ESP's for particulate matter control. A performance test was completed during the week of May 7. Results are not yet available.

Utah Power and Light reported that Hunter 1 (formerly called Emery 1) began operations in May 1979. The emission control system includes an ESP for particulate matter removal and a four-tower lime slurry FGD system for SO_2 control of flue gas generated by the 400 MW (gross) steam generator.

REFERENCES FOR EXECUTIVE SUMMARY

a. Sixth Biennial Survey of Power Equipment Requirements of the U.S. Electric Utility Industry: 1977-1986. Sponsored by the Power Equipment Division, National Electrical Manufacturers Association.

b. Temple, Barker, and Sloane, Inc. Policy Testing Model for Electric Utilities, Exhibit II-3.

c. Twelth Annual Power Engineering Survey, Power Engineering, April 1978.

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
ALABAMA ELECTRIC COOP						
TOMBIGBEE	2	LEROY	ALABAMA	9/78	1	A
TOMBIGBEE	3	LEROY	ALABAMA	6/79	2	A
ALLEGHENY POWER SYSTEM						
MITCHELL	3	COURTNEY	PENNSYLVANIA	8/82	6	B
PLEASANTS	1	BELMONT	WEST VIRGINIA	3/79	1	A
PLEASANTS	2	BELMONT	WEST VIRGINIA	9/80	2	A
ARIZONA ELECTRIC POWER COOP						
APACHE	2	COCHISE	ARIZONA	8/78	1	B
APACHE	3	COCHISE	ARIZONA	6/79	2	B
ARIZONA PUBLIC SERVICE						
CHOLLA	1	JOSEPH CITY	ARIZONA	10/73	1	B
CHOLLA	2	JOSEPH CITY	ARIZONA	4/78	1	B
CHOLLA	4	JOSEPH CITY	ARIZONA	6/80	2	B
FOUR CORNERS	1	FARMINGTON	NEW MEXICO	0/79	2	B
FOUR CORNERS	2	FARMINGTON	NEW MEXICO	0/79	2	B
FOUR CORNERS	3	FARMINGTON	NEW MEXICO	0/79	2	B
FOUR CORNERS	4	FARMINGTON	NEW MEXICO	0/82	3	B
FOUR CORNERS	5	FARMINGTON	NEW MEXICO	0/82	3	B
ASSOCIATED ELECTRIC COOP						
THOMAS HILL	3	MOBERLY	MISSOURI	1/82	3	A
BASIN ELECTRIC POWER COOP						
ANTELOPE VALLEY	1	BEULAH	NORTH DAKOTA	11/81	3	B
ANTELOPE VALLEY	2	BEULAH	NORTH DAKOTA	11/83	6	B
LARAMIE RIVER	1	WHEATLAND	WYOMING	4/80	2	A
LARAMIE RIVER	2	WHEATLAND	WYOMING	10/80	2	A
LARAMIE RIVER	3	WHEATLAND	WYOMING	4/82	3	A
BIG RIVERS ELECTRIC						
GREEN	1	SEBREE	KENTUCKY	12/79	2	A
GREEN	2	SEBREE	KENTUCKY	12/80	2	A
CENTRAL ILLINOIS LIGHT						
DUCK CREEK	1	CANTON	ILLINOIS	7/76	1	A
DUCK CREEK	2	CANTON	ILLINOIS	1/84	5	A
CENTRAL ILLINOIS PUBLIC SERV						
NEWTON	1	NEWTON	ILLINOIS	11/79	2	A
CENTRAL MAINE POWER						
SEARS ISLAND	1	PENOBSCOT BAY	MAINE	11/87	6	A
CINCINNATI GAS & ELECTRIC						
EAST BEND	2	RABBITHASH	KENTUCKY	10/81	2	A
COLORADO UTE ELECTRIC ASSN.						
CRAIG	1	CRAIG	COLORADO	6/79	2	B
CRAIG	2	CRAIG	COLORADO	11/79	2	B
COLUMBUS & SOUTHERN OHIO ELEC.						
CONESVILLE	5	CONESVILLE	OHIO	1/77	1	B
CONESVILLE	6	CONESVILLE	OHIO	6/78	1	B
POSTON	5	ATHENS	OHIO	0/83	6	B
POSTON	6	ATHENS	OHIO	0/85	6	B

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SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
COMMONWEALTH EDISON						
POWERTON	51	PERKIN	ILLINOIS	10/79	2	C
COOPERATIVE POWER ASSOCIATION						
COAL CREEK	1	UNDERWOOD	NORTH DAKOTA	5/79	2	A
COAL CREEK	2	UNDERWOOD	NORTH DAKOTA	10/80	2	A
DELMARVA POWER & LIGHT						
DELAWARE CITY	1-3	DELAWARE CITY	DELAWARE	4/80	2	C
DUQUESNE LIGHT						
ELRAMA	1-4	ELRAMA	PENNSYLVANIA	10/75	1	B
PHILLIPS	1-6	SOUTH HEIGHT	PENNSYLVANIA	7/73	1	B
EAST KENTUCKY POWER COOP						
SPURLOCK	2	MAYSVILLE	KENTUCKY	10/80	3	A
GENERAL PUBLIC UTILITIES						
COHO	1	ERIE	PENNSYLVANIA	12/85	6	A
SEWARD	7	SEWARD	PENNSYLVANIA	12/85	6	A
GULF POWER						
SCHOLZ	1,2	SNEADS	FLORIDA	8/78	1	C
HOOSIER ENERGY						
MEROM	1	SULLIVAN	INDIANA	4/81	2	A
MEROM	2	SULLIVAN	INDIANA	1/82	2	A
HOUSTON LIGHTING & POWER CO.						
W.A. PARISH	8	THOMPSONS	TEXAS	10/82	5	A
INDIANAPOLIS POWER & LIGHT						
PETERSBURG	3	PETERSBURG	INDIANA	12/77	1	A
PETERSBURG	4	PETERSBURG	INDIANA	10/83	2	A
KANSAS CITY POWER & LIGHT						
HAWTHORN	3	KANSAS CITY	MISSOURI	11/72	1	B
HAWTHORN	4	KANSAS CITY	MISSOURI	8/72	1	B
LA CYGNE	1	LA CYGNE	KANSAS	2/73	1	C
KANSAS POWER & LIGHT						
JEFFREY	1	WAMEGO	KANSAS	8/78	1	B
JEFFREY	2	WAMEGO	KANSAS	6/80	2	B
LAWRENCE	4	LAWRENCE	KANSAS	1/76	1	B
LAWRENCE	5	LAWRENCE	KANSAS	11/71	1	B
KENTUCKY UTILITIES						
GREEN RIVER	1-3	CENTRAL CITY	KENTUCKY	9/75	1	C
LAKELAND UTILITIES						
MCINTOSH	3	LAKELAND	FLORIDA	10/81	3	A
LOUISVILLE GAS & ELECTRIC						
CANE RUN	4	LOUISVILLE	KENTUCKY	8/76	1	A
CANE RUN	5	LOUISVILLE	KENTUCKY	12/77	1	A
CANE RUN	6	LOUISVILLE	KENTUCKY	3/79	1	A
MILL CREEK	1	LOUISVILLE	KENTUCKY	4/81	2	B
MILL CREEK	2	LOUISVILLE	KENTUCKY	4/82	3	B
MILL CREEK	3	LOUISVILLE	KENTUCKY	8/78	1	B
MILL CREEK	4	LOUISVILLE	KENTUCKY	7/81	2	B
PADDY'S RUN	6	LOUISVILLE	KENTUCKY	4/73	1	C

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EPA UTILITY FGD SURVEY: FEBRUARY - MARCH 1979

SECTION 1
SUMMARY LIST OF FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	UNIT LOCATION		START-UP DATE	STATUS	REG CLASS
LOUISVILLE GAS & ELECTRIC						
TRIMBLE COUNTY	1	BEDFORD	KENTUCKY	7/84	6	D
TRIMBLE COUNTY	2	BEDFORD	KENTUCKY	0/84	6	D
MIDDLE SOUTH UTILITIES						
ARKANSAS COAL	5		ARKANSAS	1/86	5	D
ARKANSAS COAL	6		ARKANSAS	1/88	5	D
LOUISIANA COAL	1		LOUSIANA	0/86	5	D
LOUISIANA COAL	2		LOUSIANA	0/88	5	D
MISSISSIPPI COAL	1		MISSISSIPPI	0/85	5	D
MISSISSIPPI COAL	2		MISSISSIPPI	0/87	5	D
MINNESOTA POWER & LIGHT						
CLAY BOSWELL	4	COHASSET	MINNESOTA	5/80	2	A
MINNKOTA POWER COOPERATIVE						
MILTON R. YOUNG	2	CENTER	NORTH DAKOTA	9/77	1	B
MONTANA POWER						
COLSTRIP	1	COLSTRIP	MONTANA	9/75	1	A
COLSTRIP	2	COLSTRIP	MONTANA	5/76	1	A
COLSTRIP	3	COLSTRIP	MONTANA	7/80	3	B
COLSTRIP	4	COLSTRIP	MONTANA	7/81	3	B
MUSCATINE POWER & WATER						
MUSCATINE	9	MUSCATINE	IOWA	0/82	6	A
NEVADA POWER						
HARRY ALLEN	1	N.E. LAS VEGAS	NEVADA	6/85	6	A
HARRY ALLEN	2	N.E. LAS VEGAS	NEVADA	6/86	6	A
HARRY ALLEN	3	N.E. LAS VEGAS	NEVADA	6/87	6	A
HARRY ALLEN	4	N.E. LAS VEGAS	NEVADA	6/88	6	A
REID GARDNER	1	MOAPA	NEVADA	4/74	1	A
REID GARDNER	2	MOAPA	NEVADA	4/74	1	A
REID GARDNER	3	MOAPA	NEVADA	6/76	1	A
REID GARDNER	4	MOAPA	NEVADA	0/83	6	A
WARNER VALLEY	1	ST. GEORGE	UTAH	6/84	6	A
WARNER VALLEY	2	ST. GEORGE	UTAH	6/85	6	A
NEW ENGLAND ELECTRIC SYSTEM						
BRAYTON POINT	3	SOMERSET	MASSACHUSETTS	0/ 0	7	C
NIAGARA MOHAWK POWER COOP						
CHARLES R. HUNTLEY	66	BUFFALO	NEW YORK	0/82	3	C
NORTHERN INDIANA PUB SERVICE						
BAILLY	7	CHESTERTON	INDIANA	0/ 0	6	C
BAILLY	8	CHESTERTON	INDIANA	0/ 0	6	C
DEAN H. MITCHELL	11	GARY	INDIANA	7/76	1	C
SCHAHFER	17	WHEATFIELD	INDIANA	6/83	5	A
SCHAHFER	18	WHEATFIELD	INDIANA	6/85	5	A
NORTHERN STATES POWER						
SHERBURNE	1	BECKER	MINNESOTA	3/76	1	B
SHERBURNE	2	BECKER	MINNESOTA	4/77	1	B
SHERBURNE	3	BECKER	MINNESOTA	5/84	4	B
OTTER TAIL POWER						
COYOTE	1	BEULAH	NORTH DOKOTA	5/81	2	B

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PACIFIC GAS & ELECTRIC						
FOSSIL	1		CALIFORNIA	0/85	6	B
FOSSIL	2		CALIFORNIA	0/86	6	B
PACIFIC POWER & LIGHT						
JIM BRIDGER	4	ROCK SPRINGS	WYOMING	9/79	2	B
PENNSYLVANIA POWER						
BRUCE MANSFIELD	1	SHIPPINGPORT	PENNSYLVANIA	12/75	1	B
BRUCE MANSFIELD	2	SHIPPINGPORT	PENNSYLVANIA	7/77	1	B
BRUCE MANSFIELD	3	SHIPPINGPORT	PENNSYLVANIA	4/80	2	B
PHILADELPHIA ELECTRIC						
CROMBY		PHOENIXVILLE	PENNSYLVANIA	6/80	6	B
EDDYSTONE	1A	EDDYSTONE	PENNSYLVANIA	9/75	1	B
EDDYSTONE	1B	EDDYSTONE	PENNSYLVANIA	6/80	4	B
EDDYSTONE	2	EDDYSTONE	PENNSYLVANIA	6/80	6	B
POTOMAC ELECTRIC POWER						
DICKERSON	4	DICKERSON	MARYLAND	0/87	6	D
POWER AUTHORITY OF NEW YORK						
ARTHUR KILL		STATEN ISLAND	NEW YORK	11/88	6	B
PUBLIC SERVICE OF INDIANA						
GIBSON	5	PRINCETON	INDIANA	0/82	5	A
PUBLIC SERVICE OF NEW MEXICO						
SAN JUAN	1	WATERFLOW	NEW MEXICO	4/78	1	B
SAN JUAN	2	WATERFLOW	NEW MEXICO	8/78	1	B
SAN JUAN	3	WATERFLOW	NEW MEXICO	6/79	2	B
SAN JUAN	4	WATERFLOW	NEW MEXICO	1/82	3	B
SALT RIVER PROJECT						
CORONADO	1	ST. JOHNS	ARIZONA	8/79	2	B
CORONADO	2	ST. JOHNS	ARIZONA	1/80	2	B
CORONADO	3	ST. JOHNS	ARIZONA	0/87	6	B
SAN MIGUEL ELECTRIC COOP						
SAN MIGUEL	1	SAN MIGUEL	TEXAS	8/80	2	A
SEMINOLE ELECTRIC						
SEMINOLE	1	PALATKA	FLORIDA	6/83	6	A
SIKESTON BOARD OF MUNIC. UTIL.						
SIKESTON	1	SIKESTON	MISSOURI	11/80	2	A
SOUTH CAROLINA PUBLIC SERVICE						
WINYAH	2	GEORGETOWN	SOUTH CAROLINA	7/77	1	A
WINYAH	3	GEORGETOWN	SOUTH CAROLINA	5/80	2	A
WINYAH	4	GEORGETOWN	SOUTH CAROLINA	5/81	3	A
SOUTHERN CALIFORNIA EDISON						
ALAMITOS	6	SEAL BEACH	CALIFORNIA	1/82	3	D
SOUTHERN ILLINOIS POWER COOP						
MARION	4	MARION	ILLINOIS	5/79	2	A
MARION	5	MARION	ILLINOIS	0/84	6	A

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SOUTHERN INDIANA GAS & ELEC						
A.B. BROWN	1	WEST FRANKLIN	INDIANA	3/79	1	A
SOUTHERN MISSISSIPPI ELECTRIC						
R.D. MORROW	1	HATTISBURG	MISSISSIPPI	8/78	1	A
R.D. MORROW	2	HATTISBURG	MISSISSIPPI	7/79	2	A
SOUTHWESTERN ELECTRIC POWER						
HENRY W. PERKEY	1	HALLSVILLE	TEXAS	2/84	3	A
SPRINGFIELD CITY UTILITIES						
SOUTHWEST	1	SPRINGFIELD	MISSOURI	4/77	1	A
SPRINGFIELD WATER, LIGHT & PWR						
DALLMAN	3	SPRINGFIELD	ILLINOIS	7/80	2	A
ST. JOE ZINC						
G.F. WEATON	1	MONACA	PENNSYLVANIA	7/79	2	B
TAMPA ELECTRIC						
BIG BEND	4	TAMPA	FLORIDA	0/85	6	A
TENNESSEE VALLEY AUTHORITY						
CUMBERLAND		CUMBERLAND CITY	TENNESSEE	7/82	6	C
JOHNSONVILLE	1-10	NEW JOHNSONVILL	TENNESSEE	0/82	5	C
PARADISE	1	PARADISE	KENTUCKY	6/82	3	C
PARADISE	2	PARADISE	KENTUCKY	3/82	3	C
SHAWNEE	10A	PADUCAH	KENTUCKY	4/72	1	C
SHAWNEE	10B	PADUCAH	KENTUCKY	4/72	1	C
WIDOWS CREEK	7	BRIDGEPORT	ALABAMA	10/80	2	C
WIDOWS CREEK	8	BRIDGEPORT	ALABAMA	5/77	1	C
TEXAS MUNICIPAL POWER AGENCY						
GIBBONS CREEK	1	CARLOS	TEXAS	1/82	3	A
TEXAS POWER & LIGHT						
SANDOW	4	ROCKDALE	TEXAS	7/80	2	A
TWIN OAKS	1		TEXAS	8/83	6	A
TWIN OAKS	2		TEXAS	0/86	6	A
TEXAS UTILITIES						
FOREST GROVE	1	ATHENS	TEXAS	0/81	5	A
MARTIN LAKE	1	TATUM	TEXAS	4/77	1	A
MARTIN LAKE	2	TATUM	TEXAS	5/78	1	A
MARTIN LAKE	3	TATUM	TEXAS	2/79	1	A
MARTIN LAKE	4	TATUM	TEXAS	0/85	3	A
MILL CREEK	1	HENDERSON	TEXAS	0/85	6	D
MILL CREEK	2	HENDERSON	TEXAS	0/86	6	D
MONTICELLO	3	MT. PLEASANT	TEXAS	5/78	1	A
UTAH POWER & LIGHT						
HUNTER	1	CASTLE DALE	UTAH	5/79	1	A
HUNTER	2	CASTLE DALE	UTAH	6/80	2	A
HUNTINGTON	1	PRICE	UTAH	5/78	1	A
WISCONSIN POWER & LIGHT						
COLUMBIA	2	PORTAGE	WISCONSIN	1/82	3	A

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UNIT IDENTIFICATION	ABSTRACT
ALABAMA ELECTRIC COOP TOMBIGBEE 2 NEW 255.0 MW (GROSS) 179.0 MW (ESC) COAL 1.15 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. PEABODY ENGINEERING WAS AWARDED A CONTRACT FOR THE INSTALLATION OF A LIMESTONE FGD SYSTEM ON THIS UNIT. A HIGH-EFFICIENCY ESP INSTALLED UPSTREAM OF THE FGD SYSTEM PROVIDES PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM CONTAINS TWO SCRUBBING TRAINS, TREATING APPROXIMATELY 70% OF THE FLUE GAS FOR REMOVAL OF SO2. STACK GAS REHEAT IS NOT REQUIRED. THE UNIT IS CURRENTLY IN THE SHAKEDOWN-DEBUGGING PHASE OF OPERATIONS.
ALABAMA ELECTRIC COOP TOMBIGBEE 3 NEW 255.0 MW (GROSS) 179.0 MW (ESC) COAL 1.15 %S BITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 3.1% STATUS 2 STARTUP 6/79	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. PEABODY ENGINEERING WAS AWARDED A CONTRACT FOR THE INSTALLATION OF A LIMESTONE FGD SYSTEM ON THIS UNIT. A HIGH-EFFICIENCY ESP INSTALLED UPSTREAM OF THE FGD SYSTEM PROVIDES PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM CONTAINS TWO SCRUBBING TRAINS, TREATING APPROXIMATELY 70% OF THE FLUE GAS FOR REMOVAL OF SO2. STACK GAS REHEAT IS NOT REQUIRED. THE UNIT IS NOW ABOUT 95% COMPLETE.
ALLEGHENY POWER SYSTEM MITCHELL 3 RETROFIT 300.0 MW (GROSS) 300.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 8/82	ALLEGHENY POWER SYSTEM WILL INSTALL FLUE GAS DESULFURIZATION EQUIPMENT ON UNIT 3 AT THE MITCHELL POWER STATION. THE UTILITY IS CURRENTLY IN THE PROCESS OF EVALUATING VARIOUS FGD TECHNOLOGIES. THE FGD INSTALLATION IS SCHEDULED TO BEGIN OPERATIONS IN AUGUST 1982.
ALLEGHENY POWER SYSTEM PLEASANTS 1 NEW 625.0 MW (GROSS) 519.0 MW (ESC) COAL 4.50 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 3/79	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE THREE PRINCIPAL OPERATING UTILITY COMPANIES OF THE ALLEGHENY POWER SYSTEM ARE INSTALLING AN EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED UNIT WHICH INCLUDES A HIGH-EFFICIENCY ESP UPSTREAM OF FOUR TRAY TOWERS FOR THE CONTROL OF PARTICULATES AND SULFUR DIOXIDE. DESIGN REMOVAL EFFICIENCIES FOR THIS EMISSION CONTROL SYSTEM ARE 90 AND 99.5 PERCENT, RESPECTIVELY. THE DRAVO CO. IS SUPPLYING THIOSORBIC LIME. THE CONSULTING A-E DESIGN FIRM FOR THIS PROJECT IS STEARNS-ROGER. ERECTION OF THE SCRUBBING EQUIPMENT IS IN PROGRESS.
ALLEGHENY POWER SYSTEM PLEASANTS 2 NEW 625.0 MW (GROSS) 519.0 MW (ESC) COAL 4.50 %S BITUMINOUS LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 9/80	THE THREE PRINCIPAL OPERATING UTILITY COMPANIES OF THE ALLEGHENY POWER SYSTEM ARE INSTALLING AN EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED UNIT WHICH INCLUDES A HIGH-EFFICIENCY ESP UPSTREAM OF FOUR TRAY TOWERS FOR THE CONTROL OF PARTICULATES AND SULFUR DIOXIDE. DESIGN REMOVAL EFFICIENCIES FOR THIS EMISSION CONTROL SYSTEM ARE 90 AND 99.5 PERCENT, RESPECTIVELY. THE DRAVO CO. IS SUPPLYING THIOSORBIC LIME. THE CONSULTING ENGINEERING FIRM IS UNITED ENGINEERS AND CONSTRUCTORS. CURRENTLY, FOUNDATION WORK ON THE SCRUBBER PLANT IS IN PROGRESS.
ARIZONA ELECTRIC POWER COOP APACHE 2 NEW 195.0 MW (GROSS) 195.0 MW (ESC) COAL .70 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 1 STARTUP 8/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE FGD SYSTEM FOR THIS NEW 200 MW UNIT WAS SUPPLIED BY RESEARCH COTTRELL. THE DESIGN INCLUDES A 22 ACRE SLUDGE POND AND A 64 ACRE ASH POND, BOTH OF WHICH ARE UNLINED AND TEN FEET DEEP. A REHEAT SYSTEM IS NOT INCLUDED. THE LINERS USED IN THE STACK AND THE DUCTS THAT LEAD TO THE STACK ARE A NEW COLE BRAND CXL2000 WHICH HAS A VERY HIGH HEAT RESISTANCE. THIS UNIT BURNS BITUMINOUS COAL WITH ASH CONTENTS OF .7% AND 10% RESPECTIVELY. INITIAL OPERATION OF THIS UNIT BEGAN IN AUGUST, 1978.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA ELECTRIC POWER COOP APACHE 3 NEW 195.0 MW (GROSS) 195.0 MW (ESC) COAL .70 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.1% STATUS 2 STARTUP 6/79	CONSTRUCTION OF UNIT 3 IS NOW ESSENTIALLY COMPLETE. STRUCTURE ERECTION OF THE SCRUBBER-ABSORBER TOWERS IS COMPLETE. EACH SCRUBBER CAN HANDLE 400,000 ACFM AT 270F AND RECIRCULATE 20,000 GPM OF SLURRY. THERE ARE CURRENTLY TWO PONDS WITH A TOTAL OF 20-YRS CAPACITY FOR DISPOSAL OF UNFIXATED SLUDGE. TWO ADDITIONAL PONDS ARE PLANNED PROVIDING AN ADDITIONAL 20 YRS OF DISPOSAL CAPABILITY. THERE WILL BE NO REHEAT. BECAUSE OF THE HIGH COST OF THE UNIT 2 STACK LINER. UNIT 3 WILL USE A CEILCOTE LINING INSTEAD OF THE CXL2000 USED IN UNIT 2.
ARIZONA PUBLIC SERVICE CHOLLA 1 RETROFIT 119.0 MW (GROSS) 119.0 MW (ESC) COAL .50 %S SUBBITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 4.2% STATUS 1 STARTUP 10/73	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION THIS LIMESTONE SCRUBBING SYSTEM WAS PLACED IN SERVICE IN OCTOBER 1973. THIS SCRUBBER PLANT CONSISTS OF TWO PARALLEL SCRUBBING TRAINS. PARTICULATE CONTROL IS PROVIDED BY TWO FLOODED DISC SCRUBBERS. SO2 CONTROL IS PROVIDED BY ONE PACKED (MUNTERS PACKING) TOWER (A-SIDE). FLUE GAS CLEANING WASTES ARE DISCHARGED TO AN EXISTING FLY ASH POND. NO WATER IS RECYCLED BACK FROM THE DISPOSAL POND. IN-LINE STEAM REHEATERS RAISE THE GAS TEMPERATURE 40 F.
ARIZONA PUBLIC SERVICE CHOLLA 2 NEW 350.0 MW (GROSS) 350.0 MW (ESC) COAL .50 %S SUBBITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE CONTRACT FOR THIS WET LIMESTONE SCRUBBING SYSTEM WAS AWARDED BY THE UTILITY TO RESEARCH-COTTRELL. THE DESIGN INCLUDES MECHANICAL COLLECTORS FOR PRIMARY PARTICULATE REMOVAL. THE FGD SYSTEM CONSISTS OF FOUR PARALLEL FLOODED DISC AND PACKED TOWER ABSORBER TRAINS. THREE ARE REQUIRED FOR FULL LOAD CAPACITY. INITIAL OPERATIONS BEGAN IN APRIL 1978. COMPLIANCE TESTING WAS COMPLETED DURING THE SECOND WEEK OF AUGUST 1978. THE UNIT IS CURRENTLY UNDERGOING SHAKEDOWN AND DEBUGGING OPERATIONS.
ARIZONA PUBLIC SERVICE CHOLLA 4 NEW 350.0 MW (GROSS) 126.0 MW (ESC) COAL .50 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	UNIT NO. 4 IS CURRENTLY UNDER CONSTRUCTION. APS HAS AWARDED THE FGD CONTRACT TO RESEARCH COTTRELL. THE STATE REGULATORY AGENCY HAS NOT YET DECIDED THE EMISSION REGULATIONS WHICH WILL APPLY TO THE PLANT. THE C-E BOILER WILL FIRE THE SAME COAL AS CHOLLA NO.1. WITH SULFUR CONTENT OF 0.44-1.0 PERCENT. THE A-E FIRM IS EBASCO. THE FGD SYSTEM IS A DOUBLE LOOP LIMESTONE ABSORPTION PROCESS AND REVENUES OF THE CONTRACT TO R-C ARE REPORTED TO BE $5 MM. FOR CONTROL OF PARTICULATE, AN ESP WILL HANDLE 100% OF THE FLUE GAS.
ARIZONA PUBLIC SERVICE FOUR CORNERS 1 RETROFIT 175.0 MW (GROSS) 175.0 MW (ESC) COAL .75 %S LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/79	APS IS UPGRADING THE OPERATIONAL PARTICULATE SCRUBBERS AT THE FOUR CORNERS 1,2, AND 3 FOR ADDITIONAL SO2 REMOVAL. CURRENTLY, EACH UNIT HAS 2 CHEMICO VENTURI SCRUBBER MODULES FOR PARTICULATE CONTROL. ROUGHLY 30% OF THE FLUE GAS SO2 CONTENT IS REMOVED AT THE PRESENT TIME IN THE VENTURIS WITH THE HIGH AKALINE FLYASH. NEW MEXICO APC OFFICIALS INDICATED THAT THE 5 FOUR CORNERS UNITS WILL BE REQUIRED TO REMOVE AT LEAST 67.5% OF THE STATION SO2(ALL 5 UNITS CONSIDERED TOGETHER). ADDITIONAL ALKALINITY WILL BE IMPARTED TO THE SCRUBBING SOLUTION BY ADDING LIME.
ARIZONA PUBLIC SERVICE FOUR CORNERS 2 RETROFIT 175.0 MW (GROSS) 175.0 MW (ESC) COAL .75 %S LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/79	APS IS UPGRADING THE OPERATIONAL PARTICULATE SCRUBBERS AT THE FOUR CORNERS 1,2, AND 3 FOR ADDITIONAL SO2 REMOVAL. CURRENTLY, EACH UNIT HAS 2 CHEMICO VENTURI SCRUBBER MODULES FOR PARTICULATE CONTROL. ROUGHLY 30% OF THE FLUE GAS SO2 CONTENT IS REMOVED AT THE PRESENT TIME IN THE VENTURIS WITH THE HIGH ALKALINE FLYASH. NEW MEXICO APC OFFICIALS INDICATED THAT THE 5 FOUR CORNERS UNITS WILL BE REQUIRED TO REMOVE AT LEAST 67.5% OF THE STATION SO2(ALL 5 UNITS CONSIDERED TOGETHER). ADDITIONAL ALKALINITY WILL BE IMPARTED TO THE SCRUBBING SOLUTION BY ADDING LIME.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
ARIZONA PUBLIC SERVICE FOUR CORNERS 3 RETROFIT 229.0 MW (GROSS) 229.0 MW (ESC) COAL .75 %S LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 0/79	APS IS UPGRADING THE OPERATIONAL PARTICULATE SCRUBBERS AT THE FOUR CORNERS 1,2, AND 3 FOR ADDITIONAL SO2 REMOVAL. CURRENTLY, EACH UNIT HAS 2 CHEMICO VENTURI SCRUBBER MODULES FOR PARTICULATE CONTROL. ROUGHLY 30% OF THE FLUE GAS SO2 CONTENT IS REMOVED AT THE PRESENT TIME IN THE VENTURIS WITH THE HIGH AKALINE FLYASH. NEW MEXICO APC OFFICIALS INDICATED THAT THE 5 FOUR CORNERS UNITS WILL BE REQUIRED TO REMOVE AT LEAST 67.5% OF THE STATION SO2(ALL 5 UNITS CONSIDERED TOGETHER). ADDITIONAL ALKALINITY WILL BE IMPARTED TO THE SCRUBBING SOLUTION BY ADDING LIME.
ARIZONA PUBLIC SERVICE FOUR CORNERS 4 RETROFIT 755.0 MW (GROSS) 755.0 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	THE UTILITY IS CURRENTLY EVALUATING THE DATA AND INFORMATION ACCUMULATED DURING THE HORIZONTAL PROTOTYPE SCRUBBING PROGRAM IN ORDER TO ASCERTAIN VARIOUS POSSIBLE STRATEGIES TO CONTROL THE EMISSIONS FROM THIS COAL FIRED 755-MW UNIT. ADS WILL BE REQUIRED TO REDUCE THE CURRENT LEVEL OF SO2 EMISSIONS FROM THE ENTIRE PLANT BY INCREASING THE REMOVAL EFFICIENCY TO AT LEAST 67.5%. A CONTRACT HAS BEEN AWARDED TO UNITED ENGINEERS FOR THE ENGINEERING AND CONSTRUCTION OF AN FGD SYSTEM.
ARIZONA PUBLIC SERVICE FOUR CORNERS 5 RETROFIT 755.0 MW (GROSS) 755.0 MW (ESC) COAL .75 %S LIME UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	THE UTILITY IS CURRENTLY EVALUATING THE DATA AND INFORMATION ACCUMULATED DURING THE HORIZONTAL PROTOTYPE SCRUBBING PROGRAM IN ORDER TO ASCERTAIN VARIOUS POSSIBLE STRATEGIES TO CONTROL THE EMISSIONS FROM THIS COAL FIRED 755-MW UNIT. APS WILL BE REQUIRED TO REDUCE THE CURRENT LEVEL OF SO2 EMISSIONS FROM THE ENTIRE PLANT BY INCREASING THE REMOVAL EFFICIENCY TO AT LEAST 67.5%. A CONTRACT HAS BE AWARDED TO UNITED ENGINEERS FOR THE ENGINEERING AND CONSTRUCTION OF AN FGD SYSTEM.
ASSOCIATED ELECTRIC COOP THOMAS HILL 3 NEW 730.0 MW (GROSS) 670.0 MW (ESC) COAL 4.80 %S LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	ASSOCIATED ELECTRIC COOP AWARDED A CONTRACT TO PULLMAN KELLOGG FOR THE ENGINEERING, PROCUREMENT AND CONSTRUCTION OF AN FGD SYSTEM ON THE UTILITY'S THOMAS HILL UNIT NO. 3 POWER PLANT. SO2 REMOVAL EQUIPMENT WILL OPERATE IN CONJUNCTION WITH A HIGH EFFICIENCY ESP. THE SYSTEM, SCHEDULED FOR START-UP IN 1982, WILL UTILIZE MAGNESIUM-PROMOTED LIMESTONE AS A REAGENT IN THE FOUR MODULE WEIR FGD SYSTEM. REHEAT WILL PROBABLY NOT BE INCLUDED. THE STACK WILL BE BRICK LINED. THE DRY FIXATED SLUDGE WILL BE HAULED TO AN ACTIVE STRIP MINE. CONSTRUCTION OF THE BOILER HAS BEGUN.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .68 %S LIGNITE LIME/SPRAY DRYING JOY MFG. CO. WESTERN PRECIPITA ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 11/81	THE UTILITY HAS SELECTED A LIME SCRUBBING PROCESS FOR THEIR PLANNED FGD SYSTEM. THE UNIT WILL FIRE LIGNITE COAL WITH A SULFUR CONTENT OF 0.68 PERCENT AND AN ASH CONTENT OF 6.0 PERCENT (6600 BTU/LB). THE WATER LOOP WILL BE OPEN WITH MAKE-UP COMING FROM COOLING TOWER BLOWDOWN. THE SLUDGE WILL BE DISPOSED IN A MINE LANDFILL. A CONTRACT HAS BEEN AWARDED TO WESTERN PRECIPITATION DIVISON, JOY MFG. CO. FOR A DRY FGD SYSTEM. THE SPRAY DRYER HAS BEEN SUBCONTRACTED TO NIRO ATOMITER.
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY 2 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .68 %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/83	THE UTILITY IS TENTATIVELY INVESTIGATING VARIOUS FGD PROCESSES FOR THIS SECOND LIGNITE-FIRED UNIT SCHEDULED AT THE NEW STATION LOCATED IN MERCER COUNTY, NEAR BEULAH, NORTH DAKOTA. THIS NEW FACILITY WILL BE KNOWN AS THE ANTELOPE VALLEY STATION AND WILL BE REQUIRED TO COMPLY WITH STATE AIR EMISSIONS STANDARDS VIA THE BEST AVAILABLE TECHNOLOGY. START-UP IS NOW SCHEDULED FOR NOVEMBER 1983.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
BASIN ELECTRIC POWER COOP LARAMIE RIVER 1 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL .80 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/80	RESEARCH-COTTRELL IS CURRENTLY FABRICATING THE DUAL-LOOP LIMESTONE WET SCRUBBERS. ON-SITE CONSTRUCTION COMMENCED IN JANUARY 1978. SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE LANDFILL. THE SCRUBBERS WILL BE MADE OF STAINLESS STEEL AND WILL HANDLE 2.3 MM ACFM AT 286 F. L/G RATIO WILL BE 60. B&W HAS BEEN AWARDED A CONTRACT FOR TWO ESP'S. THE DESIGN DOES NOT INCLUDE STACK GAS REHEAT. COOLING TOWER BLOWDOWN WILL BE USED FOR MAKE-UP WATER IN THIS CLOSED LOOP SYSTEM. CONSTRUCTION IS NOW 20% COMPLETE.
BASIN ELECTRIC POWER COOP LARAMIE RIVER 2 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL .80 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	RESEARCH-COTTRELL IS CURRENTLY FABRICATING THE DUAL-LOOP LIMESTONE WET SCRUBBERS. ON-SITE CONSTRUCTION COMMENCED IN JANUARY 1978. SLUDGE WILL BE DEWATERED TO 83% SOLIDS BEFORE LANDFILL. THE SCRUBBERS WILL BE MADE OF STAINLESS STEEL AND WILL HANDLE 2.3 MM ACFM AT 286 F. L/G RATIO WILL BE 60. B&W HAS BEEN AWARDED A CONTRACT FOR TWO ESP'S. THE DESIGN DOES NOT INCLUDE STACK GAS REHEAT. COOLING TOWER BLOWDOWN WILL BE USED FOR MAKE-UP WATER IN THIS CLOSED LOOP SYSTEM. CONSTRUCTION IS NOW 20% COMPLETE.
BASIN ELECTRIC POWER COOP LARAMIE RIVER 3 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL .54 %S LIME/SPRAY DRYING BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 4/82	LARAMIE RIVER STATION WILL FIRE SUBBITUMINOUS COAL WITH THE FOLLOWING CHARACTERISTICS: 8100 BTU/LB, 0.8 PERCENT SULFUR AND 7.0 PERCENT ASH A CONTRACT FOR A DRY TYPE FGD SYSTEM HAS BEEN AWARDED TO BABCOCK & WILCOX.
BIG RIVERS ELECTRIC GREEN 1 NEW 242.0 MW (GROSS) 242.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 12/79	THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED UNIT IS BEING SUPPLIED BY AMERICAN AIR FILTER. THE SYSTEM WILL CONSIST OF A COLD-SIDE ESP AND TWO SPRAY TOWERS CONTROLLING PARTICULATE AND SO2 TO 99.6 PERCENT AND 90 PERCENT, RESPECTIVELY. THE B&W BOILER WILL FIRE HIGH SULFUR (3.5 TO 4.5 PERCENT) WESTERN KENTUCKY COAL. CONSTRUCTION IS NOW 66% COMPLETE ON THE BOILER AND 50% COMPLETE ON THE FGD SYSTEM. THE DESIGN INCLUDES AN INDIRECT HOT AIR REHEAT SYSTEM. IUCS WILL CONSTRUCT A SLUDGE DISPOSAL SYSTEM TO SERVICE BOTH GREEN 1 AND 2.
BIG RIVERS ELECTRIC GREEN 2 NEW 242.0 MW (GROSS) 242.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 12/80	THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED UNIT IS BEING SUPPLIED BY AMERICAN AIR FILTER. THE SYSTEM WILL CONSIST OF A COLD SIDE ESP AND TWO SPRAY TOWERS CONTROLLING PARTICULATE AND SO2 TO 99.6 PERCENT AND 90 PERCENT, RESPECTIVELY. THE B&W BOILER WILL FIRE HIGH SULFUR (3.5 4.5 PERCENT) WESTERN KENTUCKY COAL. THE FGD SYSTEM WILL INCLUDE AN INDIRECT HOT AIR REHEAT SYSTEM. IUCS WILL CONSTRUCT A SLUDGE DISPOSAL SYSTEM TO SERVICE BOTH GREEN 1 AND 2. THE BOILER IS CURRENTLY 8% COMPLETE AND CONSTRUCTION HAS JUST BEGUN ON THE FGD SYSTEM.
CENTRAL ILLINOIS LIGHT DUCK CREEK 1 NEW 416.0 MW (GROSS) 416.0 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 2.9% STATUS 1 STARTUP 7/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. RILEY STOKER WAS THE SUPPLIER OF THE FOUR VENTURI-ABSORBER MODULES AT THIS UNIT. SCRUBBER TANKS AND PUMPS ARE NEOPRENE LINED. A HIGH EFFICIENCY ESP IS UPSTREAM OF THE FOUR VENTURI-ABSORBER SCRUBBER MODULES FOR PARTICULATE CONTROL. THE CONCRETE STACK IS LINED WITH CEILCOTE FLAKELINE 151. NO RE-HEAT SYSTEM IS INCLUDED. THE FIRST LIMESTONE SLURRY SCRUBBER MODULE WAS PLACED IN SERVICE ON SEPTEMBER 9,1976, AND OPERATED INTERMITTENTLY UNTIL APRIL 1, 1977. ALL FOUR MODULES BECOME OPERATIONAL ON JULY 24, 1978.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
CENTRAL ILLINOIS LIGHT DUCK CREEK 2 NEW 416.0 MW (GROSS) 416.0 MW (ESC) COAL 3.30 %S BITUMINOUS LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: 2.9% STATUS 5 STARTUP 1/84	THE UTILITY HAS NOT YET SELECTED A SYSTEM SUPPLIER. THE UTILITY WILL USE ESP"S FOR PARTICULATE CONTROL AND EITHER LIMESTONE OR DOUBLE ALKALI FOR SO2 ABSORPTION. THE UTILITY IS NOW IN THE PROCESS OF EVALUATING BIDS AND A STUDY IS UNDERWAY TO DETERMINE THE SLUDGE DISPOSAL STRATEGY THAT WILL BE EMPLOYED.
CENTRAL ILLINOIS PUBLIC SERV NEWTON 1 NEW 617.0 MW (GROSS) 617.0 MW (ESC) COAL 4.00 %S BITUMINOUS DUAL ALKALI BUELL/ENVIROTECH ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 11/79	A CONTRACT HAS BEEN AWARDED BY CIPSO TO BUELL/ENVIROTECH FOR THE INSTALLATION OF AN EMISSION CONTROL SYSTEM ON UNIT 1. THE KEY COMPONENTS OF THE EMISSION CONTROL SYSTEM INCLUDE: A HIGH-EFFICIENCY ESP; FOUR PRECOOLERS, FOUR POLYSPHERE ABSORBERS, THREE THICKENERS, TWO EXPERIMENTAL REHEAT SYSTEMS, AND THREE HORIZONTAL EXTRACTION FILTERS FOR SLUDGE DEWATERING. MORE THAN 50 PERCENT OF THE CONSTRUCTION WORK AT THE PLANT HAS BEEN COMPLETED. THE FGD SYSTEM WILL HAVE CEILCOTE-LINED ABSORBER MODULES.
CENTRAL MAINE POWER SEARS ISLAND 1 NEW 600.0 MW (GROSS) 600.0 MW (ESC) COAL ***** %S LIME/LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/87	BECAUSE OF THE DISCOVERY OF A GEOLOGICAL FAULT ON SEARS ISLAND, THE UTILITY HAS CANCELLED PLANS FOR A 1150-MW NUCLEAR POWER PLANT. A 600-MW COAL FIRED UNIT IS NOW BEING PLANNED IN ITS PLACE. COMMERCIAL OPERATION IS PROJECTED FOR NOVEMBER 1986. COMPLIANCE WITH SO_2 NSPS WILL BE ACHIEVED BY INSTALLING AN FGD SYSTEM. LIME AND LIMESTONE SCRUBBING PROCESSES ARE BEING GIVEN PRIMARY CONSIDERATION. CURRENTLY, CMPCO HAS FILED AN APPLICATION WITH THE STATE PUBLIC UTILITIES COMMISSION. A DELAY IN RECEIVING A PERMIT FROM THE MAINE PUBLIC UTILITIES COMMISSION HAS RESULTED IN A REVISED START-UP DATE OF NOVEMBER 1987.
CINCINNATI GAS & ELECTRIC EAST BEND 2 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 5.00 %S LIME BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/81	A CONTRACT HAS BEEN CONDITIONALLY AWARDED TO BABCOCK AND WILCOX FOR A COMMERCIAL LIME SCRUBBING SYSTEM. THE COAL SOURCE IS EXPECTED TO BE A WESTERN KENTUCKY COAL WITH A HIGH SULFUR CONTENT. THE THREE LIME SLURRY FGD MODULES WILL BE PRECEDED BY AN ESP FOR PARTICULATE CONTROL. A CONTRACT HAS BEEN CONDITIONALLY AWARDED TO IUCS FOR THE SLUDGE FIXATION. THE A-E FIRM IS SARGENT AND LUNDY. UNIT FOUNDATION HAS BEGUN AND FGD SYSTEM CONSTRUCTION WILL BEGIN IN EARLY 1979.
COLORADO UTE ELECTRIC ASSN. CRAIG 1 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 2 STARTUP 6/79	PEABODY PROCESS SYSTEMS HAS BEEN AWARDED A CONTRACT TO DESIGN AND SUPPLY A LIMESTONE SLURRY SPRAY TOWER ABSORBER SYSTEM FOR SO2 REMOVAL FROM LOW-SULFUR COAL-FIRED BOILER FLUE GAS FROM UNITS 1 AND 2. PARTICULATE CONTROL WILL BE PROVIDED BY HOT-SIDE ESP"S UPSTREAM OF THE ABSORBER SYSTEM. SLUDGE WILL BE STABILIZED AND HAULED TO A MINEFILL THERE WILL BE A STEAM COIL TYPE STACK GAS REHEATER INCLUDED. REQUIRED PARTICULATE AND SO2 REMOVAL EFFICIENCIES ARE 99.8 AND 85 PERCENT RESPECTIVELY. FGD CONSTRUCTION IS NOW 80% COMPLETE.
COLORADO UTE ELECTRIC ASSN. CRAIG 2 NEW 447.0 MW (GROSS) 447.0 MW (ESC) COAL .45 %S SUBBITUMINOUS LIMESTONE PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: 5.4% STATUS 2 STARTUP 11/79	PEABODY PROCESS SYSTEMS HAS BEEN AWARDED A CONTRACT TO DESIGN AND SUPPLY A LIMESTONE SPRAY TOWER ABSORBER SYSTEM FOR SO2 REMOVAL FROM LOW-SULFUR COAL-FIRED BOILER FLUE GAS FROM UNITS 1 AND 2. PARTICULATE CONTROL WILL BE PROVIDED BY HOT-SIDE ESP"S UPSTREAM OF THE ABSORBER SYSTEM. SLUDGE WILL BE STABILIZED AND HAULED TO A MINEFILL. THERE WILL BE A STEAM COIL TYPE STACK GAS REHEATER INCLUDED. REQUIRED PARTICULATE AND SO2 REMOVAL EFFICIENCIES ARE 99.8 AND 85 PERCENT RESPECTIVELY. FGD CONSTRUCTION IS NOW 80% COMPLETE.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 5 NEW 411.0 MW (GROSS) 411.0 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 1/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE BOILER AND ESP WERE COMPLETED AND PLACED IN SERVICE IN SEPTEMBER 1976. THE B-SIDE MODULE BECAME AVAILABLE FOR SERVICE IN JANUARY 1977. COMMERCIAL OPERATIONS WERE ACHIEVED ON FEBRUARY 13, 1977. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A COLD-SIDE ESP FOLLOWED BY TWO LIME TCA MODULES SUPPLIED BY UOP. DRAVO IS SUPPLING THE THIOSORBIC LIME REAGENT. IUCS IS SUPPLYING A POZ-O-TEC SLUDGE STABILIZATION FACILITY
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE 6 NEW 411.0 MW (GROSS) 411.0 MW (ESC) COAL 4.67 %S BITUMINOUS LIME AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 3.9% STATUS 1 STARTUP 6/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. C&SOE SIGNED LONG TERM CONTRACTS WITH DRAVO FOR THE PURCHACE OF THIOSORBIC LIME AND WITH IUCS FOR A SLUDGE FIXATION SYSTEM. CONSTRUCTION COMMENCED IN 1977 AND WAS COMPLETED IN JANUARY 1978. SIMILAR TO UNIT 5. THIS MINE MOUTH PLANT BURNS COAL WITH 17% ASH AND 4.5 TO 4.9% SULFUR CONTENTS. THE DESIGN INCLUDES AN ESP UPSTREAM OF THE FGD SYSTEM FOR PARTICULATE CONTROL. THE FGD SYSTEM INCLUDES TWO LIME TCA MODULES FOR THE REMOVAL OF SO2.
COLUMBUS & SOUTHERN OHIO ELEC. POSTON 5 NEW 375.0 MW (GROSS) 375.0 MW (ESC) COAL 2.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/83	THIS UNIT WILL BURN HIGH SULFUR OHIO COAL (APPROXIMATELY 2.5 PERCENT SULFUR CONTENT). THE DESIGN OF THE EMISSION CONTROL STRATEGY HAS NOT YET BEEN FINALIZED. THE PROCESS WILL EITHER BE LIME, LIMESTONE, OR DOUBLE ALKALI.
COLUMBUS & SOUTHERN OHIO ELEC. POSTON 6 NEW 375.0 MW (GROSS) 375.0 MW (ESC) COAL 2.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	THIS UNIT WILL BURN HIGH SULFUR COAL (APPROXIMATELY 2.5 PERCENT SULFUR CONTENT). THE DESIGN OF THE EMISSION CONTROL STRATEGY FOR THIS UNIT HAS NOT YET BEEN FINALIZED.
COMMONWEALTH EDISON POWERTON 51 RETROFIT 450.0 MW (GROSS) 450.0 MW (ESC) COAL 3.60 %S LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 5.6% STATUS 2 STARTUP 10/79	THE AIR CORRECTION DIVISION OF UOP WAS AWARDED THE CONTRACT FOR A WET LIMESTONE SYSTEM THAT WILL BE BACKFITTED ON TO BOILER NO. 51, ONE OF TWO IDENTICAL BOILERS SUPPLING STEAM TO AN 850-MW TURBINE-GENERATOR. THE SLUDGE WILL BE STABILIZED AND HAULED TO A LANDFILL. REHEAT WILL BE PROVIDED BY A STEAM COIL WHICH WILL HEAT THE AMBIENT AIR THAT IS PUMPED INTO THE SCRUBBER OUTLET BEFORE THE FLUE GAS ENTERS THE STACK. THE SO2 EMISSION STANDARD IS 1.8 LB. SO2/MM BTU. CONSTRUCTION IS ABOUT 50% COMPLETE.
COOPERATIVE POWER ASSOCIATION COAL CREEK 1 NEW 545.0 MW (GROSS) 327.0 MW (ESC) COAL .63 %S LIGNITE LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/79	THIS UNIT IS UNDER THE COMBINED OWNERSHIP OF COOP POWER AND UNITED POWER. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE INSTALLATION OF LIME FGD SYSTEMS ON UNITS 1 AND 2 AT THIS STATION. THE FGD SYSTEM FOR EACH BOILER WILL CONSIST OF FOUR SPRAY TOWER ABSORBER MODULES FOR SO2 REMOVAL. ELECTROSTATIC PRECIPITATORS WILL BE INSTALLED UPSTREAM OF EACH ABSORBER TRAIN. CONSTRUCTION BEGAN EARLY IN AUGUST 1977. THE UNIT IS NOW 85-90% COMPLETE. BAD WINTER WEATHER SLOWED CONSTRUCTION SLIGHTLY.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
COOPERATIVE POWER ASSOCIATION COAL CREEK 2 NEW 545.0 MW (GROSS) 327.0 MW (ESC) COAL .63 %S LIGNITE LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	THIS UNIT IS UNDER THE COMBINED OWNERSHIP OF COOP POWER AND UNITED POWER. A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR THE INSTALLATION OF LIME FGD SYSTEMS ON UNITS 1 AND 2 AT THIS STATION. THE FGD STSTEM FOR EACH BOILER WILL CONSIST OF FOUR SPRAY TOWER ABSORBER MODULES FOR SO2 REMOVAL. ELECTROSTATIC PRECIPITATORS WILL BE INSTALLED UPSTREAM OF EACH ABSORBER TRAIN. CONSTRUCTION BEGAN EARLY IN AUGUST 1977 AND THE UNIT IS NOW 45% COMPLETE. THERE HAVE BEEN MINOR DELAYS BUT START-UP IS STILL SCHEDULED FOR NOVEMBER 1979.
DELMARVA POWER & LIGHT DELAWARE CITY 1-3 RETROFIT 180.0 MW (GROSS) 180.0 MW (ESC) COKE 7.50 %S COKE WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/80	DELMARVA'S DELAWARE CITY PLANT HAS 4 BOILERS, 3 OF WHICH HAVE STEAM CAPACITIES OF 500K LBS/HR EACH. THE BOILERS GENERATE STEAM AS WELL AS ELECTRICAL POWER FOR GETTY REFINING & MARKETING. 7-8% S COKE WILL BE BURNED IN THE BOILERS (INSTEAD OF THE LOW-S CRUDE OIL NOW BURNED) WHEN THE CONTROL SYSTEM GOES INTO OPERATION IN APRIL 1980. DELMARVA WILL USE VENTURI SCRUBBERS FOR PARTICULATE REMOVAL AND WELLMAN-LORD FGD SYSTEMS AT EACH BOILER GAS EXIT FOR SO2 CONTROL. DESIGN PARTICULATE AND SO2 REMOVAL EFFICIENCIES ARE 90 AND 85-90 PERCENT RESPECTIVELY. CONSTRUCTION IS 38% COMPLETE.
DUQUESNE LIGHT ELRAMA 1-4 RETROFIT 510.0 MW (GROSS) 510.0 MW (ESC) ***** %S LIME CHEMICO ENERGY CONSUMPTION: 3.5% STATUS 1 STARTUP 10/75	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE FGD SYSTEM ON THIS 4-BOILER UNIT CONSISTS OF FIVE COMMON-HEADERED SINGLE STAGE VENTURI SCRUBBER_ABSORBERS DOWNSTREAM FROM A MECHANICAL COLLECTOR-ESP PARTICULATE REMOVAL SYSTEM. THE PLANT BURNS COAL WITH A HEATING VALVE OF 11,000 BTU/LB AND SULFUR AND ASH CONTENTS OF 1.8 TO 2.2% AND 21% RESPECTIVELY. DEWATERED SLUDGE FROM THE IUCS PLANT IS HAULED TO AN OFF-SITE LANDFILL. THE SYSTEM INCLUDES A DIRECT OIL-FIRED STACK GAS REHEAT SYSTEM. DESIGNED REMOVAL EFFICIENCIES ARE 99% (PART) AND 83% (SO2).
DUQUESNE LIGHT PHILLIPS 1-6 RETROFIT 410.0 MW (GROSS) 410.0 MW (ESC) COAL 2.00 %S LIME CHEMICO ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 7/73	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE FGD SYSTEM ON THIS 6-BOILER UNIT CONSISTS OF ONE 2-STAGE AND THREE SINGLE STAGE VENTURI SCRUBBER-ABSORBERS DOWNSTREAM FROM A MECHANICAL COLLECTOR-ESP PARTICULATE REMOVAL SYSTEM. THE PLANT BURNS COAL WITH A HEATING VALVE OF 11,000 BTU/LB AND SULFUR AND ASH CONTENTS OF 1.8 TO 2.2% AND 21% RESPECTIVELY. DEWATERED SLUDGE FROM THE IUCS PLANT IS HAULED TO AN OFF-SITE LANDFILL. THE SYSTEM INCLUDES A DIRECT OIL-FIRED STACK GAS REHEAT SYSTEM. DESIGNED REMOVAL EFFICIENCIES ARE 99%(PART) AND 83%(SO2).
EAST KENTUCKY POWER COOP SPURLOCK 2 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL 3.50 %S LIME ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 10/80	A CONTRACT HAS BEEN AWARDED TO ADL/COMBUSTION EQUIPMENT ASSOCIATES FOR A LIME SLURRY FGD SYSTEM ON THE NEW 500-MW UNIT SPURLOCK 2. PARTICULATES WILL BE CONTROLLED BY A 99.5% EFFICIENT ESP. COOLING TOWER BLOWDOWN WILL BE USED AS THE MAKE-UP WATER SOURCE FOR THE FGD SYSTEM. THE DESIGN SO2 REMOVAL EFFICIENCY IS 90%. THE SYSTEM IS NOW IN THE DESIGN PHASE.
GENERAL PUBLIC UTILITIES COHO 1 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 3.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 12/85	STARTUP DATE WAS CHANGED TO 5/88 FOR BOTH BOILER AND DESULFURIZATION SYSTEM. LIME AND LIMESTONE SCRUBBING ARE THE PRIMARY STRATEGIES BEING CONSIDERED FOR COMPLIANCE WITH NEW SOURCE PERFORMANCE STANDARDS. NO DECISION HAS BEEN MADE YET, ALTHOUGH A SLURRY TYPE SYSTEM IS NOT CONTEMPLATED.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
GENERAL PUBLIC UTILITIES SEWARD 7 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 12/85	STARTUP DATE WAS CHANGED TO 5/65 FOR BOTH BOILER AND DESULFURIZATION SYSTEM. LIME AND LIMESTONE SCRUBBING ARE THE PRIMARY STRATEGIES BEING CONSIDERED FOR COMPLIANCE WITH THE NEW SOURCE PERFORMANCE STANDARDS. NO DECISION HAS BEEN MADE YET. ALTHOUGH A SLURRY TYPE WILL NOT BE USED.
GULF POWER SCHOLZ 1,2 RETROFIT 23.0 MW (GROSS) 23.0 MW (ESC) COAL 2.50 %S BITUMINOUS LIMESTONE/THOROUGHBRED 121 CHIYODA INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 8/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. CHIYODA INTERNATIONAL SUPPLIED THIS 23 MW PROTOTYPE UNIT WHICH BEGAN OPERATION ON AUGUST 30, 1978. THE CT-121 SYSTEM INCLUDES A NEWLY DEVELOPED JET BUBBLING REACTOR WHICH FEATURES A LARGE GAS-LIQUID INTERFACIAL AREA AND PROVIDES PARTICULATE AS WELL AS SO2 REMOVAL. MIST ELIMINATION IS PROVIDED BY A DOUBLE PASS VERTICAL CHEVRON. GYPSUM IS PRODUCED AND STACKED IN THE EXISTING POND. THE STACKING CAPABILITIES OF THE GYPSUM ARE BEING TESTED, ALONG WITH THE GROUND WATER NEAR THE STACK SITE TO CHECK FOR LEACHING.
HOOSIER ENERGY MEROM 1 NEW 490.0 MW (GROSS) 441.0 MW (ESC) COAL 3.50 %S LIMESTONE MITSUBISHI INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/81	HOOSIER ENERGY AWARDED A CONTRACT TO MITSUBISHI INTERNATIONAL CORP. FOR TWO LIMESTONE FGD SYSTEMS FOR MEROM 1 AND 2. THE NEW 490 MW COAL-FIRED UNITS ARE PLANNED FOR LOCATION IN SULLIVAN, INDIANA. THE FLUE GAS STREAMS WILL BE CLEANED OF PARTICULATE WITH ESP'S (99.4%) AND OF SULFUR DIOXIDE WITH GRID-TOWER ABSORBERS (90%). SLUDGE WILL BE STABILIZED AND STOCKPILED. THE GROUND WAS BROKEN FOR CONSTRUCTION IN NOVEMBER 1977. BOILER STRUCTURAL STEEL IS NOW BEING ERECTED AND FGD FOOTINGS ARE IN PLACE
HOOSIER ENERGY MEROM 2 NEW 490.0 MW (GROSS) 441.0 MW (ESC) COAL 3.50 %S LIMESTONE MITSUBISHI INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/82	HOOSIER ENERGY AWARDED A CONTRACT TO MITSUBISHI INTERNATIONAL CORP. FOR TWO LIMESTONE FGD SYSTEMS FOR MEROM 1 AND 2. THE NEW 490 MW COAL-FIRED UNITS ARE PLANNED FOR LOCATION IN SULLIVAN, INDIANA. THE FLUE GAS STREAMS WILL BE CLEANED OF PARTICULATE WITH ESP'S (99.4%) AND OF SULFUR DIOXIDE WITH GRID-TOWER ABSORBERS (90%). SLUDGE WILL BE STABILIZED AND STOCKPILED. THE GROUND WAS BROKEN FOR CONSTRUCTION IN NOVEMBER 1977, BUT DUE TO THE BAD WINTER WEATHER, CONSTRUCTION WAS DELAYED. THE BOILER IS ESSENTIALLY COMPLETE. STARTUP IS EXPECTED SHORTLY.
HOUSTON LIGHTING & POWER CO. W.A. PARISH 8 NEW 550.0 MW (GROSS) 512.0 MW (ESC) COAL .60 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 10/82	HL&P WILL BE INSTALLING AN FGD SYSTEM ON THE UTILITY'S 600 MW W. A.-PARISH 8 UNIT. PARTICUALTE MATTER WILL BE CONTROLLED BY BAGHOUSE UPSTREAM OF THE LIMESTONE SLURRY FGD SYSTEM. THE FGD SYSTEM WILL BE DESIGNED TO REMOVE SO2 WITH AN EFFICIENCY OF GREATER THAN 83%. REHEAT WILL BE PROVIDED BY BY-PASSING 7% OF THE PARTICULATE CLEANED GAS. SLUDGE WILL BE DEWATERED, BLENDED WITH FLYASH AND DISPOSED IN AN ON SITE LANDFILL. INITIAL STARTUP IS SCHEDULED FOR FALL, 1982.
INDIANAPOLIS POWER & LIGHT PETERSBURG 3 NEW 532.0 MW (GROSS) 532.0 MW (ESC) COAL 3.25 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 2.4% STATUS 1 STARTUP 12/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE WET LIMESTONE FGD SYSTEM INSTALLED ON THIS UNIT WAS SUPPLIED BY THE AIR CORRECTION DIVISION OF UOP. UNIT 3 FIRES BITUMINOUS COAL HAVING A SULFUR CONTENT OF 1.5-4.5%. AN ASH CONTENT OF 9-10% AND A 11,000 BTU/LB VALUE. TWO ESPS PROVIDE PRIMARY PARTICULATE CONTROL UPSTREAM OF A FOUR-MODULE TCA FGD SYSTEM. STABILIZED SLUDGE IS DISPOSED ON AN ON-SITE POND. THE DESIGN INCLUDES AN INDIRECT STEAM TUBE REHEAT SYSTEM. SHAKE DOWN AND DEBUGGING OPERATIONS ARE STILL PROCEEDING.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
INDIANAPOLIS POWER & LIGHT PETERSBURG 4 NEW 530.0 MW (GROSS) 530.0 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/83	INDIANAPOLIS POWER & LIGHT AWARDED A CONTRACT TO RESEARCH COTTRELL FOR A LIME STONE FGD SYSTEM. SO2 REMOVAL EFFICIENCY WILL BE APPROXIMATELY 80 PERCENT. THIS NEW UNIT WILL FIRE HIGH-SULFUR BITUMINOUS COAL WITH A HEATING VALUE OF 11,000 BTU/LB AND ASH AND SULFUR CONTENTS OF 10 PERCENT AND 3.5 PERCENT, RESPECTIVELY. SLUDGE WILL BE DEWATERED AND MIXED WITH FLYASH TO PRODUCE A DRY STABILIZED PRODUCT. EXCAVATION, FOUNDATION WORK AND SOME STEEL WORK IS NOW IN PROGRESS ON THE UNIT.
KANSAS CITY POWER & LIGHT HAWTHORN 3 RETROFIT 90.0 MW (GROSS) 90.0 MW (ESC) COAL .60 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 11/72	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE SCRUBBER-ABSORBER SYSTEM ON THIS UNIT WAS CONVERTED FROM A LIMESTONE FURNACE INJECTION AND TAIL-END SYSTEM TO A TAIL-END LIME SLURRY SYSTEM. OPERATION IN THE LIME SCRUBBING MODE COMMENCED ON JANUARY 1, 1977. COMPLIANCE TEST INDICATED THE UNIT MEETS THE KANSAS CITY 0.17 LB/MM BTU PARTICULATE REG. FGD SYSTEM DESIGN INCLUDES A FINNED-TUBE STEAM REHEATER, AN ON-SITE UNLINED SLUDGE DISPOSAL POND, AND A CHEVRON MIST ELIMINATOR SYSTEM. THE 2 FGD MODULES CAN BE BY-PASSED IN EMERGENCIES.
KANSAS CITY POWER & LIGHT HAWTHORN 4 RETROFIT 90.0 MW (GROSS) 90.0 MW (ESC) COAL .60 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.2% STATUS 1 STARTUP 8/72	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE SCRUBBER-ABSORBER SYSTEM ON THIS UNIT WAS CONVERTED FROM A LIMESTONE FURNACE INJECTION AND TAIL-END SYSTEM TO A TAIL-END LIME SLURRY SYSTEM. OPERATION IN THE LIME SCRUBBING MODE COMMENCED ON JANUARY 1, 1977. COMPLIANCE TEST INDICATED THE UNIT MEETS THE KANSAS CITY 0.17 LB/MM BTU PARTICULATE REG. FGD SYSTEM DESIGN INCLUDES A FINNED-TUBE STEAM REHEATER, AN ON-SITE UNLINED SLUDGE DISPOSAL POND, AND A CHEVRON ELIMINATOR SYSTEM. THE 2 FGD MODULES CAN BE BY-PASSED IN EMERGENCIES.
KANSAS CITY POWER & LIGHT LA CYGNE 1 NEW 874.0 MW (GROSS) 874.0 MW (ESC) COAL 5.39 %S SUBBITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 2/73	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED POWER-GENERATING UNIT CONSISTS OF EIGHT SCRUBBER MODULES FOR FLY ASH AND SO2 REMOVAL. EACH MODULE INCLUDES A VENTURI SCRUBBER IN SERIES WITH A 2-STAGE IMPINGEMENT PLATE ABSORBER. THE SCRUBBER PLANT IS AN INTEGRAL PART OF THE POWER-GENERATING COMPLEX, ALLOWING NO FLUE GAS BYPASS. INITIAL OPERATIONS COMMENCED IN FEB. 1973. COMMERCIAL SERVICE WAS ATTAINED BY JUNE 1973.
KANSAS POWER & LIGHT JEFFREY 1 NEW 720.0 MW (GROSS) 540.0 MW (ESC) COAL .32 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 8/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. COMBUSTION ENGINEERING SUPPLIED THE LIMESTONE EMISSION CONTROL SYSTEM FOR THIS NEW COAL FIRED UNIT. THE UNIT CONSISTS OF A COLD-SIDE ESP AND SPRAY TOWERS FOR THE CONTROL OF SO2 AND PARTICULATE EMISSIONS. 30% OF THE FLUE GAS IS BYPASSED FOR REHEAT. NOX EMISSIONS ARE CONTROLLED BY AN AIR OVERFIRE SYSTEM AT THE TANGENTIALLY FIRED PULVERIZED BUNKERS. THE CLEANED GASES ARE VENTED TO A 600 FT STACK. SLUDGE IS MIXED WITH BOTTOM ASH AND DISPOSED OF IN THE EXISTING ON-SITE BOTTOM ASH POND.
KANSAS POWER & LIGHT JEFFREY 2 NEW 700.0 MW (GROSS) 490.0 MW (ESC) COAL .30 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	COMBUSTION ENGINEERING IS SUPPLYING THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL FIRED UNIT. THE SYSTEM WILL CONSIST OF A COLD-SIDE ESP AND SPRAY TOWERS FOR THE CONTROL OF PARTICULATE AND SO2 EMISSIONS. 30% OF THE FLUE GAS WILL BE BYPASSED FOR REHEAT. AN OVERFIRE AIR SYSTEM AT THE TANGENTIAL FIRED PULVERIZED BURNERS WILL CONTROL NOX EMISSIONS. THE CLEANED GASES WILL BE VENTED TO A 600 FT STACK. SLUDGE WILL BE MIXED WITH BOTTOM ASH AND DISPOSED ON-SITE IN THE BOTTOM ASH POND. THE SYSTEM STEEL WORK IS UP AND CONSTRUCTION IS APPROXIMATELY 60% COMPLETE.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
KANSAS POWER & LIGHT LAWRENCE 4 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 1/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE NEW LIMESTONE FGD SYSTEM COMMENCED OPERATIONS IN EARLY JANUARY 1977. THE NEW SYSTEM REPLACED MARBLE-BED TOWERS WITH SPRAY TOWERS. THERE HAVE BEEN NO FORCED SCRUBBER OUTAGES REPORTED SINCE START-UP. CONTINUOUS SO2 MONITORS HAVE RECORDED SO2 REMOVAL EFFICIENCIES OF BETTER THAN 85%. THE UTILITY REPORTED PARTICULATE REMOVAL IS SUCH THAT NO VISIBLE PLUME EXITS THE STACK. THE PLANT IS FIRING COAL RATED AT 10,000 BTU/LB WITH A SULFUR CONTENT OF 0.5%
KANSAS POWER & LIGHT LAWRENCE 5 RETROFIT 420.0 MW (GROSS) 420.0 MW (ESC) COAL .55 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 11/71	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE ORIGINAL LIMESTONE INJECTION AND TAIL-END SCRUBBING SYSTEM WAS SHUT DOWN ON MARCH 20 SO THAT THE NEW ROD-SCRUBBER AND SPRAY TOWER ABSORBER SYSTEM COULD BE TIED INTO THE UNIT. THE NEW SYSTEM, WHICH INCLUDES TWO MODULES, EACH CAPABLE OF HANDLING APPROXIMATELY 50 PERCENT OF THE TOTAL BOILER FLUE GAS FLOW, CAME ON LINE APRIL 14, 1978. THE SYSTEM DESIGNER AND SUPPLIER WAS COMBUSTION ENGINEERING. THE UNIT FIRES LOW SULFUR WYOMING COAL WITH A HEAT CONTENT OF 10,000 BTU/LB.
KENTUCKY UTILITIES GREEN RIVER 1-3 RETROFIT 64.0 MW (GROSS) 64.0 MW (ESC) COAL 4.00 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 3.1% STATUS 1 STARTUP 9/75	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE SCRUBBER PLANT INSTALLED AT THIS STATION CONSISTS OF ONE MODULE DESIGNED TO REMOVE PARTICULATE (VARIABLE-THROAT VENTURI) AND SO2 (MOBILE-BED CONTACTOR) FROM COAL-FIRED BOILER FLUE GAS. THE SCRUBBER WAS DESIGNED AND SUPPLIED BY AAF. SLUDGE IS DISPOSED IN AN ON-SITE UNLINED POND. THE COAL BURNED HAS SULFUR AND ASH CONTENTS OF 4.0 AND 11% RESPECTIVELY AND A MOISTURE CONTENT OF 6-10 PERCENT. INITIAL STARTUP OCCURRED IN SEPTEMBER 1975. COMMERCIAL OPERATION BEGAN IN JANUARY 1976.
LAKELAND UTILITIES MCINTOSH 3 NEW 364.0 MW (GROSS) 364.0 MW (ESC) COAL 2.56 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 10/81	THE CITY OF LAKELAND DEPARTMENT OF ELECTRIC AND WATER UTILITIES AWARDED A CONTRACT TO B&W FOR AN EMISSION CONTROL SYSTEM ON THE UTILITY'S NEW 350-MW POWER GENERAGING UNIT, MCINTOSH 3. THE UNIT WILL UTILIZE COLD SIDE ESP'S FOR PARTICULATE REMOVAL AND TWO LIMESTONE SCRUBBER ABSORBER MODULES. START-UP IS SCHEDULED FOR OCTOBER 1981. THE COAL WILL CONTAIN ABOUT 2.5% SULFUR. THE UNIT DESIGN INCLUDES A REHEAT AND AN IUCS SLUDGE DISPOSAL SYSTEM. SITE EXCAVATION HAS BEGUN.
LOUISVILLE GAS & ELECTRIC CANE RUN 4 RETROFIT 188.0 MW (GROSS) 188.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE FGD SYSTEM RETROFITTED ON THIS BOILER WAS DESIGNED AND SUPPLIED BY AMERICAN AIR FILTER AND WAS FIRST PLACED IN THE GAS PATH ON AUGUST 7, 1976. THE SYSTEM CONSISTS OF TWO PARALLEL MODULES WHICH INCLUDE MOBILE BED CONTACTORS AND OPERATE WITH A CARBIDE LIME ADDITIVE. FOLLOWING A NUMBER OF MAJOR SYSTEM MODIFICATIONS (CHEVRON-TYPE MIST ELIMINATOR, OIL FIRED REHEAT, PLASITE DUCT LINER, HIGHER L/G), THE SYSTEM SUCCESSFULLY PASSED COMPLIANCE TESTING (85% SO2 REMOVAL) ON AUGUST 3 AND 4, 1977.
LOUISVILLE GAS & ELECTRIC CANE RUN 5 RETROFIT 190.0 MW (GROSS) 190.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 12/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE FGD SYSTEM FOR THIS UNIT WAS DESIGNED AND SUPPLIED BY COMBUSTION ENGINEERING. IT CONSISTS OF TWO SPRAY TOWER ABSORBERS FOR FULL-LOAD SO2 REMOVAL AND UTILIZES CARBIDE LIME AS THE ABSORBING REAGENT. IN-LINE STEAM REHEAT, A COMMON REACTION TANK, AND A THICKENER FOR SOLIDS DEWATERING ARE INCLUDED. AN EXISTING UPSTREAM ESP PROVIDES PRIMARY PARTICULATE CONTROL. THE FGD SYSTEM BEGAN INITIAL OPERATION IN DEC. 1977 BUT A COAL STRIKE FORCED A PLANT SHUTDOWN. THE SYSTEM WAS RE-STARTED MARCH 24, 1978.

UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC CANE RUN 6 RETROFIT 288.0 MW (GROSS) 288.0 MW (ESC) COAL 3.75 %S BITUMINOUS DUAL ALKALI ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 1.0% STATUS 1 STARTUP 3/79	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. A.D. LITTLE/COMBUSTION EQUIPMENT ASSOCIATES HAS SUPPLIED THE INSTALLATION OF A DOUBLE ALKALI SYSTEM. THE FEDERAL EPA WILL SUBSIDIZE A MAXIMUM $4.5 MM FOR OPERATION, RESEARCH AND DEVELOPMENT, AND REPORT WRITING FOR A ONE-YEAR PERIOD FOLLOWING THE FIRST THREE MONTHS OF OPERATIONS (NOTE: THIS SUBSIDY WILL NOT BE APPLIED FOR ANY CAPITAL EXPENDITURES).
LOUISVILLE GAS & ELECTRIC MILL CREEK 1 RETROFIT 358.0 MW (GROSS) 358.0 MW (ESC) COAL 3.75 %S LIME/LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 2 STARTUP 4/81	A COMPLIANCE SCHEDULE WAS SUBMITTED TO THE JEFFERSON COUNTY AIR POLLUTION CONTROL DISTRICT WITH 4/81 ESTABLISHED AS THE STARTUP DATE FOR AN FGD SYSTEM. OPERATING DATA AND INFORMATION FROM THE FULL-SCALE SCRUBBER PLANT NOW IN SERVICE ON THE NO. 4 UNIT AT CANE RUN WILL BE OBTAINED BEFORE THE UTILITY PROCEEDS WITH ADDITIONAL SYSTEM DESIGN WORK. A CONTRACT WAS AWARDED TO COMBUSTION ENGINEERING FOR A LIME/LIMESTONE FGD SYSTEM.
LOUISVILLE GAS & ELECTRIC MILL CREEK 2 RETROFIT 350.0 MW (GROSS) 350.0 MW (ESC) COAL 3.75 %S LIME/LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: 1.4% STATUS 3 STARTUP 4/82	A COMPLIANCE SCHEDULE WAS SUBMITTED TO THE JEFFERSON COUNTY AIR POLLUTION CONTROL DISTRICT WITH 4/82 ESTABLISHED AS THE STARTUP DATE FOR AN FGD SYSTEM. OPERATING DATA AND INFORMATION FROM THE FULL-SCALE SCRUBBER PLANT NOW IN SERVICE ON THE NO. 4 UNIT AT CANE RUN WILL BE OBTAINED BEFORE THE UTILITY PROCEEDS WITH ADDITIONAL SYSTEM DESIGN WORK. A CONTRACT WAS AWARDED TO COMBUSTION ENGINEERING FOR A LIME/LIMESTONE FGD SYSTEM.
LOUISVILLE GAS & ELECTRIC MILL CREEK 3 NEW 442.0 MW (GROSS) 442.0 MW (ESC) COAL 3.75 %S BITUMINOUS LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: 1.6% STATUS 1 STARTUP 8/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE SYSTEM WAS DESIGNED AND SUPPLIED BY AAF AND UTILIZES CARBIDE LIME AS THE ABSORBENT. FOUR MOBILE-BED ABSORBERS TREAT THE FLUE GAS RESULTING FROM THE COMBUSTION OF HIGH-SULFUR COAL. THE SYSTEM OPERATES IN AN OPEN WATER LOOP. THE SCRUBBING WASTE IS STABILIZED WITH FLYASH AND LIME. THE UNIT BECAME OPERATIONAL ON AUGUST 13, 1978.
LOUISVILLE GAS & ELECTRIC MILL CREEK 4 NEW 495.0 MW (GROSS) 495.0 MW (ESC) COAL 3.75 %S LIME AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/81	BECAUSE POWER DEMAND HAS NOT COME UP AS RAPIDLY AS HAD BEEN EXPECTED, UNIT START-UP HAS BEEN MOVED BACK TO JULY 1981. CONSTRUCTION OF THIS NEW 495-MW COAL-FIRED UNIT IS ON SCHEDULE. CURRENTLY, FOUNDATION WORK IS IN PROGRESS. THIS AAF SYSTEM WILL INCLUDE MOBILE-BED ABSORBERS TREATING HIGH SULFUR COAL FLUE GAS. THE SYSTEMS WATER LOOP WILL BE CLOSED. THE SLUDGE WILL BE STABILIZED WITH LIME AND FLYASH. STEAM REHEAT WILL PROVIDE GAS TEMPERATURE ELEVATION OF THE SCRUBBED GASES PRIOR TO DISCHARGE TO THE MAIN STACK.
LOUISVILLE GAS & ELECTRIC PADDY'S RUN 6 RETROFIT 72.0 MW (GROSS) 72.0 MW (ESC) COAL 2.50 %S LIME COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.6% STATUS 1 STARTUP 4/73	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS SCRUBBING SYSTEM WAS DESIGNED BY COMBUSTION ENGINEERING AND PLACED IN SERVICE IN APRIL 1973. THE FGD SYSTEM CONSISTS OF TWO 2-STAGE MARBLE BED ABSORBERS WHICH ARE DESIGNED TO USE CARBIDE LIME ADDITIVE AS THE SCRUBBING REAGENT. PADDYS RUN NO. 6 IS A PEAK-LOAD UNIT THAT OPERATES ONLY DURING DEMAND PERIODS. AN EXTENSIVE EPA SCRUBBER/SLUDGE EVALUATION STUDY WAS COMPLETED IN AUGUST 1977. THIS UNIT WILL BE RETIRED WHEN MILL CREEK 3 BECOMES FULLY OPERATIONAL.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 1 NEW 575.0 MW (GROSS) 575.0 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 7/84	LG&E WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE UTILITY'S TRIMBLE COUNTY UNITS. THE 575-MW UNITS WILL BURN COAL WITH AN AVERAGE 4% SULFUR CONTENT (IF NO COAL WASH IS INCLUDED). PARTICULATE MATTER WILL BE CONTROLLED BY ESP'S AND SO2 WILL BE CONTROLLED BY WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS AS YET, UNDECIDED. START-UP IS SCHEDULED FOR JULY 1984 AND 1986 RESPECTIVELY.
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY 2 NEW 575.0 MW (GROSS) 575.0 MW (ESC) COAL 4.00 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/84	LG&E WILL BE INSTALLING FGD SYSTEMS ON TWO OF THE UTILITY'S TRIMBLE COUNTY UNITS. THE 575-MW UNITS WILL BURN COAL WITH AN AVERAGE 4% SULFUR CONTENT (IF NO COAL WASH IS INCLUDED). PARTICULATE MATTER WILL BE CONTROLLED BY ESP'S AND SO2 WILL BE CONTROLLED BY WET SCRUBBING (90% REMOVAL EFFICIENCY). SLUDGE DISPOSAL STRATEGY IS AS YET, UNDECIDED. START-UP IS SCHEDULED FOR JULY 1984 AND 1986 RESPECTIVELY.
MIDDLE SOUTH UTILITIES ARKANSAS COAL 5 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 1/86	A CONTRACT HAS BEEN AWARDED FOR BOILERS AND TURBINES ON SIX NEW MIDDLE SOUTH UTILITIES UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD INSTALLATIONS ALTHOUGH THE TYPE OF FGD SYSTEM HAS NOT YET BEEN DETERMINED.
MIDDLE SOUTH UTILITIES ARKANSAS COAL 6 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 1/88	A CONTRACT HAS BEEN AWARDED FOR BOILERS AND TURBINES ON SIX NEW MIDDLE SOUTH UTILITIES UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD INSTALLATIONS ALTHOUGH THE TYPE OF FGD SYSTEM HAS NOT YET BEEN DETERMINED.
MIDDLE SOUTH UTILITIES LOUISIANA COAL 1 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/86	A CONTRACT HAS BEEN AWARDED FOR BOILERS AND TURBINES ON SIX NEW MIDDLE SOUTH UTILITIES UNITS. THE UTILITY IS CURRENTLY REQUEST/EVALVATING BIDS FOR THE FGD INSTALLATIONS ALTHOUGH THE TYPE OF FGD SYSTEM HAS NOT YET BEEN DETERMINED.
MIDDLE SOUTH UTILITIES LOUISIANA COAL 2 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/88	A CONTRACT HAS BEEN AWARDED FOR BOILERS AND TURBINES ON SIX NEW MIDDLE SOUTH UTILITIES UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD INSTALLATIONS ALTHOUGH THE TYPE OF FGD SYSTEM HAS NOT YET BEEN DETERMINED.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL 1 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/85	A CONTRACT HAS BEEN AWARDED FOR BOILERS AND TURBINES ON SIX NEW MIDDLE SOUTH UTILITIES UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD INSTALLATIONS ALTHOUGH THE TYPE OF FGD SYSTEM HAS NOT YET BEEN DETERMINED.
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL 2 NEW 890.0 MW (GROSS) 890.0 MW (ESC) COAL .50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/87	A CONTRACT HAS BEEN AWARDED FOR BOILERS AND TURBINES ON SIX NEW MIDDLE SOUTH UTILITIES UNITS. THE UTILITY IS CURRENTLY REQUESTING/EVALUATING BIDS FOR THE FGD INSTALLATIONS ALTHOUGH THE TYPE OF FGD SYSTEM HAS NOT YET BEEN DETERMINED.
MINNESOTA POWER & LIGHT CLAY BOSWELL 4 NEW 500.0 MW (GROSS) 475.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/80	MINNESOTA P&L HAS AWARDED A CONTRACT TO PEABODY PROCESS SYSTEMS FOR A LIME/ALKALINE FLYASH SCRUBBING SYSTEM. THE CONFIGURATION WILL BE VENTURI SCRUBBERS FOLLOWED BY SPRAY TOWERS. HOT SIDE ESP'S WILL BE USED FOR PARTICULATE CONTROL. STACK GAS REHEAT WILL BE ACCOMPLISHED BY BYPASSING 5% OF FLUE GAS AROUND THE SCRUBBER. THE UNIT WILL FIRE SUBBITUMINOUS COLSTRIP COAL WITH A SULFUR CONTENT OF 0.8%, AND AN ASH CONTENT OF 9.0% (HEATING VALUE-8300 BTU/LB). MAKE-UP WATER SOURCE WILL BE THE RIVER AND THE CLAY LINED POND. CONSTRUCTION OF THE FGD SYSTEM IS ABOUT 90% COMPLETE.
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG 2 NEW 477.0 MW (GROSS) 405.0 MW (ESC) COAL .70 %S LIGNITE LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 1.9% STATUS 1 STARTUP 9/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS LIME/ALKALINE FLYASH SCRUBBING WAS DESIGNED AND SUPPLIED BY ADL/COMBUSTION EQUIPMENT ASSOCIATES. IT CONSISTS OF A COLD-SIDE ESP FOLLOWED BY TWO SPRAY TOWERS. THE DESIGN INCLUDES A WASH TRAY AND A CHEVRON MIST ELIMINATOR. 15% FLUE GAS BYPASS PROVIDES STACK GAS REHEAT. THE UNIT FIRES A LOW-SULFUR NORTH DOKOTA LIGNITE WITH AN AVERAGE ASH CONTENT OF 8 PERCENT, SULFUR CONTENT OF 0.7 PERCENT, AND HEAT CONTENT OF 6500 BTU/LB. THE FLYASH ALKALINITY IS USED AS THE PRIMARY SO2 REAGENT.
MONTANA POWER COLSTRIP 1 NEW 360.0 MW (GROSS) 360.0 MW (ESC) COAL .77 %S SUBBITUMINOUS LIME ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 9/75	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS FGD EQUIPPED UNIT WAS DECLARED COMMERCIAL IN NOVEMBER 1975. THE SCRUBBING SYSTEM PROVIDES PARTICULATE AND SO2 CONTROL WITH THREE SCRUBBER MODULES. EACH MODULE CONSISTS OF A DOWNFLOW VENTURI SCRUBBER CENTERED WITHIN AN UPFLOW SPRAY TOWER ABSORBER. EACH MODULE CAN TREAT 40% OF THE TOTAL BOILER FLUE GAS AND THE MODULES CANNOT BE BYPASSED. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED DISPOSAL POND. IN-LINE STEAM REHEAT AND CLOSED WATER LOOP CAPABILITY ARE INCLUDED IN THE SYSTEM.
MONTANA POWER COLSTRIP 2 NEW 360.0 MW (GROSS) 360.0 MW (ESC) COAL .77 %S SUBBITUMINOUS LIME ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: 3.3% STATUS 1 STARTUP 5/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS FGD EQUIPPED UNIT WAS DECLARED COMMERCIAL IN AUGUST 1976. THE SCRUBBING SYSTEM PROVIDES PARTICULATE AND SO2 CONTROL WITH THREE SCRUBBER MODULES. EACH MODULE CONSISTS OF A DOWNFLOW VENTURI SCRUBBER CENTERED WITHIN AN UPFLOW SPRAY TOWER ABSORBER. EACH MODULE CAN TREAT 40% OF THE TOTAL BOILER FLUE GAS AND THE MODULES CANNOT BE BYPASSED. THE UNSTABILIZED SLUDGE IS DISPOSED IN AN ON-SITE LINED DISPOSAL POND. IN-LINE STEAM REHEAT AND CLOSED WATER LOOP CAPABILITY ARE INCLUDED IN THE SYSTEM.

SECTION 2
STATUS OF FGD SYSTEMS

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UNIT IDENTIFICATION
                                                         ABSTRACT
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MONTANA POWER                         A CONTRACT FOR THE INSTALLATION OF TWO ADDITIONAL LIME/ALKALINE FLYASH
COLSTRIP                              SCRUBBING SYSTEMS HAS BEEN AWARDED TO A.D. LITTLE/COMBUSTION EQUIPMENT
3                                     ASSOCIATES. THESE SYSTEMS WILL BE INSTALLED ON UNITS 3 AND 4 OF THE
NEW       700.0 MW (GROSS)            COLSTRIP POWER STATION. COLSTRIP UNITS 1 AND 2 ARE BOTH EQUIPPED WITH
          700.0 MW (ESC)              OPERATIONAL LIME/ALKALINE FLYASH SCRUBBING SYSTEMS FOR THE REMOVAL OF
COAL                                  PARTICULATES AND SULFUR DIOXIDE.
  .70 %S
LIME/ALKALINE FLYASH
ADL/COMBUSTION EQUIP ASSOCIATE
ENERGY CONSUMPTION: ****%
STATUS 3     STARTUP  7/80
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MONTANA POWER                         A CONTRACT FOR THE INSTALLATION OF TWO ADDITIONAL LIME/ALKALINE FLYASH
COLSTRIP                              SCRUBBING SYSTEMS HAS BEEN AWARDED TO A.D. LITTLE/COMBUSTION EQUIPMENT
4                                     ASSOCIATES. THESE SYSTEMS WILL BE INSTALLED ON UNITS 3 AND 4 OF THE
NEW       700.0 MW (GROSS)            COLSTRIP POWER STATION. COLSTRIP UNITS 1 AND 2 ARE BOTH EQUIPPED WITH
          700.0 MW (ESC)              OPERATIONAL LIME/ALKALINE FLYASH SCRUBBING SYSTEMS FOR THE REMOVAL OF
COAL                                  PARTICULATES AND SULFUR DIOXIDE.
  .70 %S
LIME/ALKALINE FLYASH
ADL/COMBUSTION EQUIP ASSOCIATE
ENERGY CONSUMPTION: ****%
STATUS 3     STARTUP  7/81
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MUSCATINE POWER & WATER               MP&W ANNOUNCED PLANS TO INSTALL A LIME OR LIMESTONE SLURRY FGD
MUSCATINE                             SYSTEM ON MUSCATINE 9.  PARTICULATE MATTER WILL BE CONTROLLED BY AN
9                                     ESP FOLLOWED BY THE FGD SYSTEM FOR SO2 REMOVAL.  THE SYSTEM DESIGN
NEW       160.0 MW (GROSS)            FEATURES TWO 100% CAPACITY ABSORBER TOWERS, A STEAM COIL REHEAT
          160.0 MW (ESC)              SYSTEM AND A FORCED OXIDATION SYSTEM TO PRODUCE SLUDGE PRODUCT
COAL                                  SUITABLE FOR LANDFILL AFTER DRYING.
  .30 %S  BITUMINOUS
PROCESS NOT SELECTED
VENDOR NOT SELECTED
ENERGY CONSUMPTION:  5.0%
STATUS 6     STARTUP  0/82
------------------------------------------------------------------------------------------------------------
NEVADA POWER                          CONSIDERING HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICA-
HARRY ALLEN                           TIONS HAVE NOT YET BEEN PREPARED.
1
NEW       500.0 MW (GROSS)
          500.0 MW (ESC)
COAL
***** %S
PROCESS NOT SELECTED
VENDOR NOT SELECTED
ENERGY CONSUMPTION: ****%
STATUS 6     STARTUP  6/85
------------------------------------------------------------------------------------------------------------
NEVADA POWER                          CONSIDERING HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICA-
HARRY ALLEN                           TIONS HAVE NOT YET BEEN PREPARED.
2
NEW       500.0 MW (GROSS)
          500.0 MW (ESC)
COAL
***** %S
PROCESS NOT SELECTED
VENDOR NOT SELECTED
ENERGY CONSUMPTION: ****%
STATUS 6     STARTUP  6/86
------------------------------------------------------------------------------------------------------------
NEVADA POWER                          CONSIDERING HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICA-
HARRY ALLEN                           TIONS HAVE NOT YET BEEN PREPARED.
3
NEW       500.0 MW (GROSS)
          500.0 MW (ESC)
COAL
***** %S
PROCESS NOT SELECTED
VENDOR NOT SELECTED
ENERGY CONSUMPTION: ****%
STATUS 6     STARTUP  6/87
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SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER HARRY ALLEN 4 NEW 500.0 MW (GROSS) 500.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/88	CONSIDERING HOT SIDE ESP IN CONJUNCTION WITH AN FGD SYSTEM. SPECIFICATIONS HAVE NOT YET BEEN PREPARED.
NEVADA POWER REID GARDNER 1 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/74	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM CONSISTS OF ONE MODULE CONTAINING A TWIN VARIABLE THROAT VENTURI SCRUBBER FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE-STAGE PERFORATED-PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MECHANICAL COLLECTORS. AN INDIRECT STEAM HOT AIR REHEAT SYSTEM RAISES THE GAS TEMPERATURE 30F PRIOR TO DISCHARGE TO THE MAIN STACK. THE FLUE GAS CLEANING WASTES ARE ULTIMATELY DISPOSED IN AN ON-SITE CLAY-LINED SOLAR EVAPORATION POND.
NEVADA POWER REID GARDNER 2 RETROFIT 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/74	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM CONSISTS OF ONE MODULE CONTAINING A TWIN VARIABLE THROAT VENTURI SCRUBBER FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE-STAGE PERFORATED-PLATE WASH TOWER. PRIMARY PARTICULATE CONTROL IS PROVIDED BY UPSTREAM MECHANICAL COLLECTORS. AN INDIRECT STEAM HOT AIR REHEAT SYSTEM RAISES THE GAS TEMPERATURE 30F PRIOR TO DISCHARGE TO THE MAIN STACK. THE FLUE GAS CLEANING WASTES ARE ULTIMATELY DISPOSED IN AN ON-SITE CLAY-LINED SOLAR EVAPORATION POND.
NEVADA POWER REID GARDNER 3 NEW 125.0 MW (GROSS) 125.0 MW (ESC) COAL .50 %S SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 6/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS UNIT IS A NEW COAL-FIRED BOILER THAT IS EQUIPPED WITH SODIUM CARBONATE-BASED (TRONA) SCRUBBING SYSTEM WHICH INCORPORATES A TWIN VARIABLE-THROAT VENTURI SCRUBBER FOLLOWED BY A SEPARATOR IN SERIES WITH A SINGLE-STAGE PERFORATED-PLATE WASH TOWER. MECHANICAL COLLECTORS PROVIDE PRIMARY PARTICULATE CONTOL. REHEAT IS PROVIDED BY A INDIRECT STEAM HOT AIR REHEAT SYSTEM. WASTE IS DISPOSED IN AN ON-SITE CLAY-LINED POND.
NEVADA POWER REID GARDNER 4 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL .75 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/83	NEVADA POWER COMPANY HAS SCRAPPED THEIR ORIGINAL PLANS TO MAKE UNIT 4 A COPY OF UNIT 3. THE NEW PLANS CALL FOR A 250-MW UNIT TO BE IN OPERATION BY 1983. THE UTILITY IS PREPARING SPECIFICATIONS AT THIS TIME. CONSTRUCTION IS SCHEDULED TO START IN 1980.
NEVADA POWER WARNER VALLEY 1 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/84	SPECIFICATIONS ARE BEING PREPARED FOR A SCRUBBING SYSTEM. NEVADA POWER HAS NOT YET ANNOUNCED PLANS FOR THIS UNIT'S EMISSION CONTROL STRATEGY.

UNIT IDENTIFICATION	ABSTRACT
NEVADA POWER WARNER VALLEY 2 NEW 250.0 MW (GROSS) 250.0 MW (ESC) COAL ***** %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/85	SPECIFICATIONS ARE BEING PREPARED FOR A SCRUBBING SYSTEM. NEVADA POWER HAS NOT YET ANNOUNCED PLANS FOR THIS UNIT'S EMISSION CONTROL STRATEGY.
NEW ENGLAND ELECTRIC SYSTEM BRAYTON POINT 3 RETROFIT 650.0 MW (GROSS) 650.0 MW (ESC) OIL 1.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 7 STARTUP 0/ 0	NEW ENGLAND ELECTRIC SYSTEM HAS REQUESTED PERMISSION TO BURN 1.5% SULFUR COAL AT THIS UNIT. THIS IS ALLOWABLE UNDER STATE STANDARDS BUT SO2 EMISSIONS WOULD BE ABOVE ALLOWABLE FEDERAL LEVELS. A DECISION BY THE EPA IS STILL PENDING. MEANWHILE, THE UTILITY IS INVESTIGATING VARIOUS ADVANCE REGENERABLE FGD SYSTEMS WHICH OFFER A BREAKTHROUGH IN OPERATING COSTS AND PRODUCE ELEMENTAL SULFUR AS AN END PRODUCT. THE UTILITY IS CURRENTLY INVOLVED IN BENCH AND LABORATORY SCALE INVESTIGATIONS OF SULFUR RECOVERY. THIS UNIT IS CURRENTLY OPERATIONAL FIRING LOW SULFUR FUEL OIL.
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY 66 RETROFIT 100.0 MW (GROSS) 100.0 MW (ESC) COAL 1.80 %S AQUEOUS CARBONATE ROCKWELL INTERNATIONAL ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/82	A CONTRACT WAS AWARDED TO ATOMICS INTERNATIONAL FOR THE DESIGN AND INSTALLATION OF AN AQUEOUS CARBONATE FGD SYSTEM. THIS DEMONSTRATION SYSTEM WILL PRODUCE END-PRODUCT SULFUR. FUNDS ARE BEING PROVIDED BY THE U.S. EPA AND THE EMPIRE STATE ELECTRIC ENERGY RESEARCH CORP. THE DESIGN SO2 REMOVAL EFFICIENCY WILL BE 90 PERCENT. ROCKWELL INTERNATIONAL IS PRESENTLY IN THE DESIGN PHASE.
NORTHERN INDIANA PUB SERVICE BAILLY 7 RETROFIT 190.0 MW (GROSS) 190.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/ 0	NORTHERN INDIANA PUBLIC SERVICE IS CURRENTLY CONSIDERING A LIME OR LIMESTONE SCRUBBING UNIT FOR BAILLY 7 AND 8. THEY ARE ALSO WAITING FOR PERFORMANCE RESULTS OF THE WELLMAN LORD/ALLIED CHEMICAL UNIT IN SERVICE AT DEAN H. MITCHELL 11. LOW SULFUR COAL MAY BE EMPLOYED TO COMPLY WITH SO2 EMISSION REGUALTIONS. APPLICABLE INDIANA SO2 REGULATIONS ARE STILL NOT FIRMLY ESTABLISHED.
NORTHERN INDIANA PUB SERVICE BAILLY 8 RETROFIT 400.0 MW (GROSS) 400.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/ 0	NORTHERN INDIANA PUBLIC SERVICE IS CURRENTLY CONSIDERING A LIME OR LIMESTONE SCRUBBING UNIT FOR BAILLY 7 AND 8. THEY ARE ALSO WAITING FOR PERFORMANCE RESULTS OF THE WELLMAN LORD/ALLIED CHEMICAL UNIT IN SERVICE AT DEAN H. MITCHELL 11. LOW SULFUR COAL MAY BE EMPLOYED TO COMPLY WITH SO2 EMISSION REGULATIONS. APPLICABLE INDIANA SO2 REGULATIONS ARE STILL NOT FIRMLY ESTABLISHED.
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL 11 RETROFIT 115.0 MW (GROSS) 115.0 MW (ESC) COAL 3.50 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 7/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION THIS FGD SYSTEM IS AN INTEGRATION OF THE WELLMAN-LORD SO2 RECOVERY PROCESS OFFERED BY DAVY POWERGAS AND THE SO2 TO SULFUR REDUCTION PROCESS DEVELOPED BY ALLIED CHEMICAL. DAVY POWERGAS IS THE DESIGN AND CONSTRUCTION FIRM AND ALLIED CHEMICAL IS SYSTEM OPERATOR AND PRODUCT MARKETER. PERFORMANCE TESTS WERE SUCCESSFULLY COMPLETED ON SEPTEMBER 14, 1977. A DEMONSTRATION YEAR COMMENCED ON SEPTEMBER 16, 1977.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
NORTHERN INDIANA PUB SERVICE SCHAHFER 17 NEW 421.0 MW (GROSS) 421.0 MW (ESC) COAL 3.20 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/83	NIPSCO IS REQUESTING/EVALUATING BIDS FOR FGD SYSTEMS ON SCHAHFER 17 AND 18. ALTHOUGH THE SO2 CONTROL STRATEGY HAS NOT BEEN SELECTED THE UTILITY IS CONSIDERING A SODIUM BASED SYSTEM. PARTICULATE MATTER WILL BE CONTROLLED BY AN ESP. THE SYSTEM DESIGN WILL INCLUDE A REHEAT SYSTEM.
NORTHERN INDIANA PUB SERVICE SCHAHFER 18 NEW 421.0 MW (GROSS) 421.0 MW (ESC) COAL 3.20 %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 6/85	NIPSCO IS REQUESTING/EVALUATING BIDS FOR FGD SYSTEMS ON SCHAHFER 17 AND 18. ALTHOUGH THE SO2 CONTROL STRATEGY HAS NOT BEEN SELECTED THE UTILITY IS CONSIDERING A SODIUM BASED SYSTEM. PARTICULATE MATTER WILL BE CONTROLLED BY AN ESP. THE SYSTEM DESIGN WILL INCLUDE A REHEAT SYSTEM.
NORTHERN STATES POWER SHERBURNE 1 NEW 740.0 MW (GROSS) 740.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 3/76	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. FULL COMMERCIAL OPERATION OF THE SYSTEM BEGAN ON MAY 1, 1976. THE SCRUBBING SYSTEM FOR THIS UNIT CONSISTS OF 12 MODULES. EACH SCRUBBING MODULE INCORPORATES A VENTRI-ROD SECTION AND A MARBLE BED ABSORBER FOR PARTICULATE AND SULFUR DIOXIDE REMOVAL. A FORCED OXIDATION SYSTEM CONVERTS ALL THE CALCIUM SULFITE TO SULFATE PRIOR TO DISCHARGE TO A CLAY-LINED SETTLING POND. STACK GAS REHEAT IS PROVIDED BY IN-LINE HOT WATER TUBES. THE COAL BURNED AT THIS UNIT CONTAINS 0.8% SULFUR AND 9-10% ASH.
NORTHERN STATES POWER SHERBURNE 2 NEW 740.0 MW (GROSS) 740.0 MW (ESC) COAL .80 %S SUBBITUMINOUS LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING ENERGY CONSUMPTION: 2.7% STATUS 1 STARTUP 4/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE SHERBURNE NO. 2 AIR QUALITY CONTROL SYSTEM IS IDENTICAL IN DESIGN TO THE SYSTEM IN OPERATION ON THE NO. 1 UNIT AT THIS STATION. TWELVE 2-STAGE PARTICULATE SCRUBBER (VENTRI-ROD SCRUBBER) AND SULFUR DIOXIDE ABSORBER (MARBLE-BED ABSORBER) MODULES ARE PROVIDED FOR FLYASH AND SO2 CONTROL. ELEVEN MODULES ARE EQUIPPED FOR FULL GENERATING CAPACITY OPERATIONS. THE CALCIUM SULFITE IS FORCIBLY OXIDIZED TO SULFATE PRIOR TO DISCHARGE TO THE DISPOSAL POND. IN-LINE HOT WATER TUBES PROVIDE STACK GAS REHEAT.
NORTHERN STATES POWER SHERBURNE 3 NEW 860.0 MW (GROSS) 860.0 MW (ESC) COAL .80 %S LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 5/84	TWO ADDITIONAL COAL-FIRED POWER-GENERATING UNITS ARE SCHEDULED TO BE INSTALLED AT NSP'S SHERBURNE COUNTY GENERATING STATION IN BECKER MINNESOTA. A LETTER OF INTENT HAS BEEN SIGNED WITH C-E FOR A LIMESTONE SLURRY SPRAY TOWER SYSTEM FOR THIS NEW 860-MW UNIT. THE 2-STAGE SCRUBBING SYSTEM WILL REMOVE PARTICULATES (99.5%) & SO2 (80%). THE BOILER CONTRACT HAS BEEN AWARDED TO BABCOCK & WILCOX AND THE TURBINE WILL BE SUPPLIED BY GENERAL ELECTRIC. START-UP HAS BEEN DELAYED TO MAY 1984 AND CONSTRUCTION START-UP HAS BEEN DELAYED UNTIL APRIL 1980 DUE TO ENVIRONMENTAL PROBLEMS.
OTTER TAIL POWER COYOTE 1 NEW 440.0 MW (GROSS) 440.0 MW (ESC) COAL .87 %S LIGNITE AQUEOUS CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I. ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/81	THIS NEW COAL-FIRED STATION IS JOINTLY OWNED BY FIVE UTILITIES. OTTER TAIL POWER IS THE MAJOR OWNER AND CONSTRUCTOR. MONTANA-DAKOTA UTILITES IS THE FACILITY OPERATOR. THIS PLANNED UNIT WILL FIRE LOW SULFUR LIGNITE FROM THE MERCER COUNTY AREA IN A B&W CYCLONE BOILER. THE CONTRACT FOR THIS AQUEOUS CARBONATE/FABRIC FILTER SO2 SCRUBBER-ABSORBER WAS AWARDED TO WHEELABRATOR-FRYE AND ATOMICS INTERNATIONAL. THE DRY REMOVAL SYSTEM COMBINES AI'S AQUEOUS CARBONATE PROCESS IN A W-F FABRIC FILTER. UNIT CONSTRUCTION IS NOW 30% COMPLETE AND FGD SYSTEM CONSTRUCTION HAS JUST BEGUN.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PACIFIC GAS & ELECTRIC FOSSIL 1 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL .80 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	PG&E ANNOUNCED PLANS TO BUILD TWO 800-MW COAL-FIRED POWER GENERATING UNITS IN NORTHERN CALIFORNIA. THE FIRST UNIT WILL BURN COAL WITH A HEATING VALUE OF 12000 BTU/LB, 0.8% SULFUR AND 10% ASH CONTENTS. THE SECOND UNIT WILL BURN COAL OF AN EQUAL OR BETTER QUALITY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START-UP DATES ARE 1985 AND 1986 FOR NOS. 1 AND 2 RESPECTIVELY. CONSTRUCTION IS NOT ENVISIONED TO BEGIN BEFORE TWO OR THREE YEARS.
PACIFIC GAS & ELECTRIC FOSSIL 2 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL .80 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	PG&E ANNOUNCED PLANS TO BUILD TWO 800-MW COAL-FIRED POWER GENERATING UNITS IN NORTHERN CALIFORNIA. THE FIRST UNIT WILL BURN COAL WITH A HEATING VALUE OF 12000 BTU/LB, 0.8% SULFUR AND 10% ASH CONTENTS. THE SECOND UNIT WILL BURN COAL OF AN EQUAL OR BETTER QUALITY. THE EMISSION CONTROL SYSTEM WILL CONSIST OF A BAGHOUSE AND A LIMESTONE FGD SYSTEM. SLUDGE WILL BE DISPOSED OF IN A LANDFILL. START-UP DATES ARE 1985 AND 1986 FOR NOS. 1 AND 2 RESPECTIVELY. CONSTRUCTION IS NOT ENVISIONED TO BEGIN BEFORE TWO OR THREE YEARS.
PACIFIC POWER & LIGHT JIM BRIDGER 4 NEW 550.0 MW (GROSS) 550.0 MW (ESC) COAL .56 %S SUBBITUMINOUS SODIUM CARBONATE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 9/79	THE AIR CORRECTION DIVISION OF UOP WAS AWARDED A CONTRACT FOR AN FGD SYSTEM AT THIS NEW-509 MW COAL-FIRED UNIT. THE FGD SYSTEM WILL CONSIST OF PARALLEL TRAY TOWER ABSORBER MODULES, EACH TREATING ONE-THIRD OF THE BOILER FLUE GAS AT FULL LOAD. AN ESP WILL PROVIDE PRIMARY PARTICULATE CONTROL. AN ACID BRICK LINED WET STACK IS INCLUDED IN THE SYSTEM. PPL'S PILOT STUDY INSPECTION REVEALED SCALE FORMATION PROBLEMS. TESTS ARE BEING CONDUCTED TO RESOLVE THIS PROBLEM. THE UTILITY EXPECTS TO CONDUCT A SYSTEM CHECKOUT IN 7/79 WITH COMMERCIAL STARTUP AT THE END OF 1979.
PENNSYLVANIA POWER BRUCE MANSFIELD 1 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 12/75	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS EMISSION CONTROL SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 FROM 3.35 MM ACFM OF FLUEGAS USING THIOSORBIC LIME AS A SCRUBBING ABSORBENT. THE INITIAL SHAKEDOWN AND DEBUGGING PHASE OF OPERATION BEGAN FOR PART OF THE SYSTEM IN DECEMBER 1975. PARTIAL COMMERCIAL OPERATION COMMENCED IN APRIL 1976. THE UNIT WAS CERTIFIED FULL-LOAD COMMERCIAL IN JUNE 1976. THE FGD SYSTEM HAS EXPERIENCED OPERATIONAL PROBLEMS SINCE IT HAS BEEN IN SERVICE REQUIRING A NUMBER OF SYSTEM REPAIRS AND DESIGN MODIFICATIONS.
PENNSYLVANIA POWER BRUCE MANSFIELD 2 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S BITUMINOUS LIME CHEMICO ENERGY CONSUMPTION: 6.0% STATUS 1 STARTUP 7/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS EMISSION CONTROL SYSTEM WAS DESIGNED TO REMOVE FLYASH AND SO2 FROM 3.35 MM ACFM OF FLUE GAS USING THIOSORBIC LIME AS A SCRUBBING ABSORBENT. SIX SCRUBBING TRAINS, EACH INCLUDING TWO VENTURI SCRUBBERS IN SERIES ARRANGEMENT, ARE PROVIDED FOR FULL-LOAD OPERATION. THE INITIAL SHAKEDOWN AND DEBUGGING PHASE OF OPERATION BEGAN FOR THREE TRAINS IN JULY, 1977. FULL COMMERCIAL OPERATION FOR THE ENTIRE SYSTEM COMMENCED ON OCTOBER 1, 1977.
PENNSYLVANIA POWER BRUCE MANSFIELD 3 NEW 917.0 MW (GROSS) 917.0 MW (ESC) COAL 3.00 %S LIME PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 4/80	A CONTRACT WAS AWARDED TO PULLMAN KELLOGG FOR THE FGD SYSTEM AT THIS UNIT. THE EMISSION CONTROL SYSTEM FOR THIS UNIT WILL CONSIST OF ESP'S UP-STREAM OF FIVE WEIR HORIZONTAL CROSSFLOW WET SCRUBBING MODULES. EACH MODULE CONSISTS OF SIX STAGES, ONE BEING A SPARE. SLUDGE WILL BE DISPOSED OF BY THE EXISTING SYSTEM AT THE BRUCE MANSFIELD PLANT. LINER IN THE STACK WILL BE AN INCONEL 625 MATERIAL. THE UNIT IS CURRENTLY UNDER CONSTRUCTION WITH ESP'S 70-80 PERCENT COMPLETE AND THE FGD SYSTEM 30 PERCENT COMPLETE. UNIT START-UP WILL BE IN APRIL 1980.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
PHILADELPHIA ELECTRIC CROMBY RETROFIT 150.0 MW (GROSS) 150.0 MW (ESC) COAL 3.00 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/80	THE UTILITY PLANS TO RETROFIT ONE OF THE TWO BOILERS AT CROMBY WITH AN FGD SYSTEM. HOWEVER, A FINAL DECISION HAS NOT BEEN MADE. THE SYSTEM BEING GIVEN PRIMARY CONSIDERATION IS MAGNESIUM OXIDE. CURRENTLY, THE UTILITY IS RE-NEGOTIATING CONSENT ORDERS AND THE START-UP DATE OF JUNE 1980 IS TENTATIVE.
PHILADELPHIA ELECTRIC EDDYSTONE 1A RETROFIT 120.0 MW (GROSS) 120.0 MW (ESC) COAL 2.60 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 9/75	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE EMMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF THREE PARALLEL SCRUBBING TRAINS FOR THE CONTROL OF PARTICULATE AND SULFUR DIOXIDE. THE C-SIDE SCRUBBING TRAIN INCLUDES AN SO2 ABSORBER MODULE IN SERIES WITH A PARTICULATE SCRUBBER. APPROXIMATELY ONE-THIRD OF THE BOILER FLUE GAS IS SCRUBBED WITH MAGNESIUM OXIDE SLURRY FOR SO2 REMOVAL. THE SPENT SLURRY IS REGENERATED AT THE ESSEX SULFURIC ACID PLANT IN NEWARK, N.J. THE REGENERATED MAGOX IS RETURNED TO THE PLANT FOR SO2 SCRUBBING SERVICE.
PHILADELPHIA ELECTRIC EDDYSTONE 1B RETROFIT 240.0 MW (GROSS) 240.0 MW (ESC) COAL 2.60 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 4 STARTUP 6/80	THE INSTALLATION OF AN FGD SYSTEM ON THE BALANCE OF THE FLUE GAS FROM THIS UNIT WILL FOLLOW PENDING THE OUTCOME OF THE PERFORMANCE OF THE EXPERIMENTAL SCRUBBING UNIT WHICH HAS BEEN INSTALLED AND CURRENTLY OPERATIONAL ON THIS UNIT. CURRENTLY, 3 PARTICULATE SCRUBBERS ARE TREATING THE FULL GAS LOAD FROM THIS UNIT. CONSENT ORDERS ARE PRESENTLY BEING RE-NEGOTIATED AND THE START-UP DATE OF JUNE, 1980 IS TENTATIVE.
PHILADELPHIA ELECTRIC EDDYSTONE 2 RETROFIT 334.0 MW (GROSS) 334.0 MW (ESC) COAL 2.50 %S MAGNESIUM OXIDE UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/80	THE UTILITY IS AWAITING PERFORMANCE RESULTS FROM THE EXPERIMENTAL FGD SYSTEM INSTALLED ON UNIT 1 AT THIS STATION BEFORE PRECEEDING WITH THE DESIGN OF AN FGD SYSTEM FOR THIS COAL-FIRED BOILER. THE SYSTEM BEING GIVEN PRIMARY CONSIDERATION IS MAGNESIUM OXIDE, DESIGNED JOINTLY BY UNITED ENGINEERS AND PHILADELPHIA ELECTRIC. CURRENTLY, THE UTILITY IS RE-NEGOTIATING CONSENT ORDERS AND THE START UP DATE OF JUNE 1980 IS TENTATIVE.
POTOMAC ELECTRIC POWER DICKERSON 4 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 2.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	THERE ARE NO FIRM PLANS FOR INSTALLATION OF AN FGD SYSTEM. STARTUP DATE OF THE BOILER IS PLANNED FOR 1985. THIS UNIT WILL BURN 2% SULFUR COAL WITH A HEATING VALUE OF 11000 BTU/LB.
POWER AUTHORITY OF NEW YORK ARTHUR KILL NEW 700.0 MW (GROSS) 700.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 11/88	THE UTILITY IS CONSIDERING BOTH REGENERABLE AND LIMESTONE FGD PROCESSES. FGD TECHNOLOGY IS BEING CONSIDERED FOR A FOSSIL FUEL BURNING UNIT WHICH WILL EMPLOY COAL AS THE PRIMARY FUEL AND OIL AS BACKUP. REFUSE WILL BE PROVIDED AS A SUPPLEMENTAL FUEL SUPPLY. THE PREFERRED PLANT SITE IS THE ARTHUR KILL FACILITY LOCATED ON STATEN ISLAND. THE PROJECT DESIGN ENGINEERING FIRM IS SARGENT AND LUNDY. PUBLIC SERVICE COMMISSION HEARINGS ARE IN PROGRESS.

UNIT IDENTIFICATION	ABSTRACT
PUBLIC SERVICE OF INDIANA GIBSON 5 NEW 650.0 MW (GROSS) 650.0 MW (ESC) COAL 3.30 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/82	PUBLIC SERVICE CO OF INDIANA ANNOUNCED PLANS FOR THE CONSTRUCTION OF THIS NEW 650-MW COAL FIRED POWER GENERATING UNIT AT GIBSON STATION. BIDS HAVE BEEN RECIEVED AND ARE BEING EVALUATED. INITIAL START-UP IS SCHEDULED FOR 1982.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 1 RETROFIT 361.0 MW (GROSS) 361.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 4.4% STATUS 1 STARTUP 4/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS FGD SYSTEM IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS OF DAVY POWERGAS AND ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. A HOT SIDE ELECTROSTATIC PRECIPITATOR PRECEEDS THE FGD SYSTEM, OF THE FOUR ABSORBER TOWERS INSTALLED. THREE ARE NEEDED TO CARY THE FULL LOAD. THE COAL BURNED AT THIS UNIT HAS SULFUR AND ASH CONTENTS OF .8% AND 20% RESPECTIVELY, THE SYSTEM OPERATES ON A CLOSED WATER LOOP WITH RIVER WATER BEING USED AS MAKE-UP FOR LOSSES DUE TO EVAPORATION.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 2 RETROFIT 350.0 MW (GROSS) 350.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 8/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS FGD SYSTEM IS AN INTEGRATION OF THE WELLMAN LORD SO2 RECOVERY PROCESS OF DAVY POWERGAS/ALLIED CHEMICAL'S SO2 REDUCTION TO SULFUR PROCESS. A HOT SIDE ELECTROSTATIC PRECIPITATOR PRECEEDS THE FGD SYSTEM. THE SYSTEM INCLUDES FOUR ABSORBER TOWERS. THREE OF WHICH ARE NECESSARY TO CARRY THE FULL LOAD. THE WATER LOOP IS CLOSED WITH RIVER WATER BEING USED TO MAKE UP FOR LOSSES DUE TO EVAPORATION. THE COAL BURNED AT THIS UNIT HAS SULFUR AND ASH CONTENTS OF 0.8% AND 20% RESPECTIVELY.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 3 NEW 534.0 MW (GROSS) 534.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/79	A CONTRACT HAS BEEN AWARDED TO DAVY POWERGAS TO SUPPLY FOUR ABSORBER TOWERS FOR REMOVAL OF SO2 AT THIS NEW UNIT. ONE MODULE IS EXPECTED TO BE OPERATIONAL BY JUNE 1979 WHICH WILL BRING THE UNIT INTO COMPLIANCE WITH FEDERAL NSPS. THE REMAINING THREE MODULES SHOULD BE OPERATIONAL BY JANUARY 1982 AT WHICH TIME THE UNIT WILL BE IN COMPLIANCE OF STATE STANDARDS. POWER PLANT CONSTRUCTION IS BEHIND SCHEDULE BUT ABSORBER CONSTRUCTION IS PROCEEDING AS PLANNED. IT IS POSSIBLE THAT THE FINAL THREE ABSORBERS MAY BE IN AS EARLY AS JANUARY 1981.
PUBLIC SERVICE OF NEW MEXICO SAN JUAN 4 NEW 534.0 MW (GROSS) 534.0 MW (ESC) COAL .80 %S WELLMAN LORD DAVY POWERGAS ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	DAVY POWERGAS HAS BEEN AWARDED A CONTRACT TO SUPPLY THE SO2 REMOVAL SYSTEM FOR THIS UNIT. THE PLANS INCLUDE A WELLMAN LORD SO2 RECOVERY PROCESS AS WELL AS AN UPSTREAM ELECTROSTATIC PRECIPITATOR FOR PRIMARY PARTICULATE REMOVAL. FGD OPERATIONS ARE EXPECTED TO BEGIN AT THIS PLANT IN JANUARY 1982.
SALT RIVER PROJECT CORONADO 1 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 8/79	THIS NEW UNIT WILL BURN LOW SULFUR WESTERN COAL. A MAXIMUM OF 80% OF THE FLUE GAS WILL BE SCRUBBED TO MEET SULFUR DIOXIDE EMISSION REGULATIONS. PULLMAN/KELLOGG WILL PROVIDE 2 WEIR HORIZONTAL SPRAY TOWERS UTILIZING LIMESTONE SLURRY FOR SO2 CONTROL. THE SYSTEM WILL UTILIZE RUBBER-LINED SLURRY RECYCLE PUMPS, EACH RATED AT 9800 GPM. RIGIFLAKE-LINED SCRUBBER MODULES, VERTICAL HEIL MIST ELIMINATORS AND A MINIMUM OF 20 PERCENT OF THE FLUE GAS WILL BE BYPASSED FOR REHEAT. THE SLUDGE WILL BE PONDED. STRUCTURAL WORK IS 90% COMPLETE.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SALT RIVER PROJECT CORONADO 2 NEW 350.0 MW (GROSS) 260.0 MW (ESC) COAL 1.00 %S SUBBITUMINOUS LIMESTONE PULLMAN KELLOGG ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 1/80	THIS NEW UNIT WILL BURN LOW SULFUR WESTERN COAL. A MAXIMUM OF 60% OF THE FLUE GAS WILL BE SCRUBBED TO MEET SULFUR DIOXIDE EMISSION REGULATIONS. PULLMAN/KELLOGG WILL PROVIDE 2 WEIR HORIZONTAL SPRAY TOWERS UTILIZING LIMESTONE SLURRY FOR SO2 CONTROL. THE SYSTEM WILL UTILIZE RUBBER-LINED SLURRY RECYCLE PUMPS, EACH RATED AT 9800 GPM, RIGIFLAKE-LINED SCRUBBER MODULES, VERTICAL HEIL MIST ELIMINATORS AND A MINIMUM OF 20 PERCENT OF THE FLUE GAS WILL BE BYPASSED FOR REHEAT. THE SLUDGE WILL BE PONDED. STRUCTURAL WORK IS 60% COMPLETE.
SALT RIVER PROJECT CORONADO 3 NEW 350.0 MW (GROSS) 280.0 MW (ESC) COAL 1.00 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/87	THIS NEW UNIT WILL BURN SULDUR WESTERN COAL. EIGHTY PERCENT OF THE GAS WILL BE SCRUBBED TO MEET SULFUR DIOXIDE EMISSION REGULATIONS. UTILITY IS CURRENTLY CONSIDERING THE INSTALLATION OF TWO HORIZONTAL SPRAY TOWERS EMPLOYING A LIMESTONE SCRUBBING SOLUTION TO REMOVE SO2. FROM THE FLUE GAS. SCHEDULED COMMERCIAL OPERATION DATE IS 1987. PLANS FOR AN EMISSION CONTROL SYSTEM HAVE NOT BEEN FINALIZED. SLUDGE WILL PROBABLY BE PONDED.
SAN MIGUEL ELECTRIC COOP SAN MIGUEL 1 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL 1.70 %S LIGNITE LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 8/80	THE EMISSION CONTROL EQUIPMENT FOR THE COAL-FIRED RADIANT BOILER WILL CONSIST OF AN ESP UPSTREAM OF FOUR LIMESTONE SCRUBBING MODULES. THE SCRUBBER FLUE GAS CAPACITY IS NOMINALLY DESIGNED AT 1.579 MILLION ACFM (302 F). DESIGN SO2 REMOVAL EFFICIENCY IS 86 PERCENT FOR 4400 PPM SO2 INLET. L/G RATIOS ARE 10 AND 45 FOR QUENCHER AND ABSORBER, RESPECTIVELY. RESEARCH COTTRELL HAS BEEN AWARDED THE SLUDGE DISPOSAL CONTRACT. FGD SYSTEM FOUNDATION AND STRUCTURAL STEEL WORK IS COMPLETE. INITIAL START-UP IS SCHEDULED FOR LATE SUMMER 1980.
SEMINOLE ELECTRIC SEMINOLE 1 NEW 620.0 MW (GROSS) 620.0 MW (ESC) COAL 2.75 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 6/83	SEMINOLE ELECTRIC HAS ANNOUNCED PLANS TO CONSTRUCT ONE AND POSSIBLY TWO NEW 600 MW COAL-FIRED UNITS. THE UTILITY INTENDS TO UTILIZE ESPS FOR PARTICULATE REMOVAL AND A LIMESTONE FGD SYSTEM FOR SO2 CONTROL OF EMISSIONS FROM THE BURNING OF 2.75% SULFUR, 8.5% ASH COAL (11000 BTU/LB HEATING VALUE). THE UTILITY EXPECTS TO INITIATE REQUESTS FOR BIDS FOR THE FGD SYSTEM IN MAY 1979.
SIKESTON BOARD OF MUNIC. UTIL. SIKESTON 1 NEW 235.0 MW (GROSS) 235.0 MW (ESC) COAL 2.80 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 11/80	B&W WAS AWARDED A CONTRACT FOR THE BOILER AIR QUALITY CONTROL SYSTEM. THE AQCS WILL CONSIST OF 2 ESP'S FOLLOWED BY 3 FGD MODULES, EACH CAPABLE OF HANDLING 50% OF THE BOILER LOAD; ONE WILL BE ON STAND-BY AT ALL TIMES. THE UNIT WILL BURN A 2.8% SULFUR COAL. THE SIKESTON STATION WILL FEATURE AN FRP-LINED STACK, 2 PONDS (ONE FOR FLY ASH, ONE FOR SCRUBBER SLUDGE-BOTTOM ASH DISPOSAL), AND 4 AXIAL FLOW FANS. NO STACK GAS REHEAT IS PLANNED. MAXIMUM FLUE GAS CAPACITY IS 748,390 ACFM AT 288 F. BOILER STRUCTURAL STEEL ERECTION IS NOW ABOUT 33% COMPLETE
SOUTH CAROLINA PUBLIC SERVICE WINYAH 2 NEW 280.0 MW (GROSS) 140.0 MW (ESC) COAL 1.00 %S BITUMINOUS LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: .7% STATUS 1 STARTUP 7/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A 100% CAPACITY ESP FOLLOWED BY A 50% CAPACITY LIMESTONE FGD SYSTEM. ONE FGD MODULE, CONSISTING OF A VENTURI SCRUBBER AND TRAY TOWER ABSORBER, REMOVES 70% OF THE INLET SO2. REHEAT IS SUPPLIED BY FLUE GAS BYPASS. THE SCRUBBING WASTES ARE DISCHARGED TO AN ON-SITE, UNLINED DIKED POND. THE NO. 2 UNIT COMMENCED INITIAL OPERATION IN JULY 1977.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SOUTH CAROLINA PUBLIC SERVICE WINYAH 3 NEW 280.0 MW (GROSS) 280.0 MW (ESC) COAL 1.70 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/80	A CONTRACT HAS BEEN AWARDED TO BABCOCK & WILCOX FOR THE INSTALLATION OF THE FGD SYSTEM ON THIS UNIT. PARTICULATE REMOVAL WILL BE PROVIDED BY RESEARCH COTTRELL ESP'S. THE BOILER IS A COAL-FIRED DRY-BOTTOM UNIT WHICH WILL BURN COAL WITH A 1.7% SULFUR CONTENT AND A HEAT VALUE OF 11,500 BTU/LB. THE GENERATING EQUIPMENT IS BEING SUPPLIED BY RILEY STOKER. 100% OF THE FLUE GAS WILL BE SCRUBBED. ALL FGD FOOTINGS HAVE BEEN POURED AND TANK FABRICATION IS COMPLETE. DUCTWORK IS IN PROGRESS.
SOUTH CAROLINA PUBLIC SERVICE WINYAH 4 NEW 280.0 MW (GROSS) 280.0 MW (ESC) COAL ***** %S BITUMINOUS LIMESTONE AMERICAN AIR FILTER ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 5/81	SOUTH CAROLINA PUBLIC SERVICE AWARDED A CONTRACT TO AMERICAN AIR FILTER FOR THE INSTALLATION OF AN FGD SYSTEM ON WINYAH 4. PARTICULATE MATTER WILL BE CONTROLLED BY AN ESP. THE SYSTEM DESIGN INCLUDES TWO LIMESTONE SLURRY SPRAY TOWERS AND AN INDIRECT STEAM COIL REHEAT SYSTEM. THE UTILITY PLANS TO OPERATE THE UNIT WITH A CLOSED WATER LOOP.
SOUTHERN CALIFORNIA EDISON ALAMITOS 6 RETROFIT 480.0 MW (GROSS) 175.0 MW (ESC) OIL .25 %S LIME SO. CALIFORNIA EDISON/STEARNS- ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	AS A RESULT OF AN "EMISSION OFFSET" AGREEMENT, STANDARD OIL OF OHIO HAS CONTRACTED SCE AND STEARNS AND RODGERS TO INSTALL A LIME SCRUBBING SYSTEM ON ITS EXISTING ALAMITOS 6 UNIT. THE FGD SYSTEM WILL TREAT ONE THIRD OF THE FLUE GAS WITH HORIZONTAL WEIR MODULES. REHEAT WILL BE PROVIDED BY THE BALANCE OF THE FLUE GAS. THE SLUDGE WILL BE DEWATERED BY CENTRIFUGES OR DISC DRYERS AND HAULED TO AN OFFSITE LANDFILL.
SOUTHERN ILLINOIS POWER COOP MARION 4 NEW 184.0 MW (GROSS) 184.0 MW (ESC) COAL 3.00 %S LIMESTONE BABCOCK & WILCOX ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 5/79	THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED BOILER CONSISTS OF AN ESP FOR PARTICULATE CONTROL FOLLOWED BY 2 SPRAY TOWERS FOR SO2 CONTROL. LIMESTONE SLURRY WILL BE USED AS THE SCRUBBING REAGENT. SIPC IS NOT PLANNING TO UTILIZE FLUE GAS REHEAT AND IS CURRENTLY PLANNING ON A BRICK LINING FOR THE STACK. SIPC INTENDS TO USE A LANDFILL WITH ASH STABILIZATION FOR SLUDGE DISPOSAL. CONSTRUCTION IS NEARLY 100% COMPLETE AND THE SYSTEM HAS BEEN AIR TESTED. THE BOILER IS NOW OPERATING. THE FGD SYSTEM WILL START IN MAY.
SOUTHERN ILLINOIS POWER COOP MARION 5 NEW 300.0 MW (GROSS) 300.0 MW (ESC) COAL 3.00 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/84	SOUTHERN ILLINOIS POWER COOP IS PLANNING A NEW COAL-FIRED UNIT FOR ITS MARION STATION, MARION 5. THE FGD PROCESS HAS NOT BEEN DECIDED. THE UNIT WILL FIRE 3.0% SULFUR COAL AND MAY START UP AS EARLY AS 1983. THE UTILITY IS WAITING FOR THE FINALIZATION OF THE SO2 REGULATIONS THEY WILL HAVE TO MEET.
SOUTHERN INDIANA GAS & ELEC A.B. BROWN 1 NEW 265.0 MW (GROSS) 265.0 MW (ESC) COAL 4.50 %S DUAL ALKALI FMC CORPORATION ENERGY CONSUMPTION: 1.9% STATUS 1 STARTUP 3/79	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE UTILITY HAS AWARDED A CONTRACT TO FMC FOR THE INSTALLATION OF A DOUBLE ALKALI SCRUBBING SYSTEM UTILIZING SODA ASH AND LIME. THIS UNIT IS A PART OF A NEW POWER STATION LOCATED IN WEST FRANKLIN, INDIANA. THE SYSTEM WILL PRODUCE A FILTER CAKE WASTE PRODUCT WHICH WILL BE DISPOSED OF IN AN ON-SITE LANDFILL. THE PARTICULATE EMISSIONS WILL BE CONTROLLED BY A BUELL-ENVIROTECH COLD-SIDE ESP.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
SOUTHERN MISSISSIPPI ELECTRIC R.D. MORROW 1 NEW 200.0 MW (GROSS) 124.0 MW (ESC) COAL 1.30 %S LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 5.5% STATUS 1 STARTUP 8/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. PARTICULATES WILL BE CONTROLLED BY A HIGH-EFFICIENCY ESP UPSTREAM OF THE FGD SYSTEM. DESIGN SO2 AND PARTICULATE REMOVAL EFFICIENCIES ARE 85 AND 99.6%, RESPECTIVELY. A WATER SPRAY HAS BEEN ADDED IN THE BY-PASS DUCT TO PROTECT THE LINER FROM TEMPERATURE EXCURSION. SLUDGE WILL BE STABILIZED WITH FLYASH AND DISPOSED OF ON-SITE. INITIAL STARTUP HAS BEGUN. HOWEVER DUE TO BOILER PROBLEMS NO OPERATING TIME HAS BEEN ACCUMULATED. ACCEPTANCE TESTING IS EXPECTED IN NOVEMBER.
SOUTHERN MISSISSIPPI ELECTRIC R.D. MORROW 2 NEW 200.0 MW (GROSS) 124.0 MW (ESC) COAL 1.30 %S LIMESTONE RILEY STOKER/ENVIRONEERING ENERGY CONSUMPTION: 5.5% STATUS 2 STARTUP 7/79	A CONTRACT WAS AWARDED BY SME TO RILEY STOKER/ENVIRONEERING FOR THIS FGD SYSTEM. PARTICULATES WILL BE CONTROLLED BY A HIGH-EFFICIENCY ESP UPSTREAM OF THE FGD SYSTEM. DESIGN SULFUR DIOXIDE AND PARTICULATE EFFICIENCIES ARE 85 AND 99.6 PERCENT, RESPECTIVELY. A WATER SPRAY HAS BEEN ADDED IN THE BY-PASS DUCT TO PROTECT THE LINER FROM TEMPERATURE EXCURSION. SLUDGE WILL BE STABILIZED WITH FLYASH AND DISPOSED ON THE PLANT SITE. CONSTRUCTION OF THE WET LIMESTONE SCRUBBING SYSTEM IS NOW IN ITS FINAL STAGES. THE BOILER IS NOW IN OPERATION.
SOUTHWESTERN ELECTRIC POWER HENRY W. PERKEY 1 NEW 720.0 MW (GROSS) 720.0 MW (ESC) COAL .80 %S LIGNITE LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 2/84	A CONTRACT FOR THE EMISSION CONTROL SYSTEM HAS BEEN AWARDED TO THE AIR CORRECTION DIVISION OF UOP. THE SYSTEM DESIGN INCLUDES TWO COLD-SIDE ESP'S FOR PARTICULATE REMOVAL UP-STREAM FROM 4 SPRAY TOWERS WHICH UTILIZE LIMESTONE SLURRY FOR SO2 CONTROL. SLUDGE DISPOSAL WILL BE HANDLED BY AN IUCS SYSTEM. START-UP IS EXPECTED BY FEBRUARY 1984.
SPRINGFIELD CITY UTILITIES SOUTHWEST 1 NEW 194.0 MW (GROSS) 194.0 MW (ESC) COAL 3.50 %S BITUMINOUS LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: 4.6% STATUS 1 STARTUP 4/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE EMISSION CONTROL SYSTEM FOR THIS NEW COAL-FIRED UNIT CONSISTS OF A FOUR-FIELD HIGH EFFICIENCY ESP (99.6% DESIGN) AND 2 TURBULENT CONTACT ABSORBER MODULES (80% DESIGN) FOR THE CONTROL OF PARTICULATES AND SO2. BOTH THE ESP AND LIMESTONE FGD SYSTEM ARE SUPPLIED BY UOP. THE SCRUBBING WASTES ARE DEWATERED BY A ROTARY DRUM VACUUM FILTER AND THE FILTER CAKE IS HAULED AWAY TO A LANDFILL. INITIAL OPERATION OF THE FGD SYSTEM OCCURRED IN APRIL 77. IN SEPT. 77, THE UNIT SUCCESSFULLY COMPLETED COMPLIANCE TESTING.
SPRINGFIELD WATER, LIGHT & PWR DALLMAN 3 NEW 205.0 MW (GROSS) 205.0 MW (ESC) COAL 3.30 %S LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/80	A CONTRACT WAS AWARDED TO RESEARCH COTTRELL FOR THE INSTALLATION OF A LIMESTONE FGD SYSTEM. REQUIRED SULFUR DIOXIDE REMOVAL EFFICIENCY IS 90 PERCENT. A SLUDGE DISPOSAL STRATEGY HAS NOT BEEN FINALIZED, BUT THE UTILITY IS CONSIDERING EITHER PONDING OR LANDFILL. CONSTRUCTION OF THE FGD SYSTEM FOUNDATIONS HAVE BEGUN. ALL SYSTEMS ARE ON SCHEDULE. THE BOILER OPERATION WAS SCHEDULED TO COMMENCE IN JUNE 1978.
ST. JOE ZINC G.F. WEATON 1 RETROFIT 60.0 MW (GROSS) 60.0 MW (ESC) COAL 3.00 %S CITRATE BUREAU OF MINES ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/79	CONSTRUCTION CONTINUES ON THE CITRATE PROCESS SCRUBBING SYSTEM WHICH WILL CONTROL SO2 EMISSIONS FROM A 60-MW COAL-FIRED POWER GENERATING UNIT AT ST. JOE ZINC. THIS UNIT PROVIDES POWER FOR THE LOCAL UTILITY GRID. FGD SYSTEM START-UP IS SCHEDULED FOR DECEMBER 1978. THE REGENERABLE FGD SYSTEM WILL PRODUCE ELEMENTAL SULFUR AS A BY-PRODUCT. ALL MAJOR CONSTRUCTION IS COMPLETE. WIRING AND PIPING WORK IS NOW BEING COMPLETED.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TAMPA ELECTRIC BIG BEND 4 NEW 450.0 MW (GROSS) 450.0 MW (ESC) COAL 2.50 %S PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	TAMPA ELECTRIC HAS ANNOUNCED PLANS TO INSTALL AN FGD SYSTEM AT BIG BEND 4 WHICH IS SCHEDULED TO BEGIN OPERATIONS EARLY IN 1985. THE FGD PROCESS HAS NOT YET BEEN SELECTED. PRIMART PARTICULATE CONTROL WILL BE PROVIDED BY AN ELECTROSTATIC PRICIPITATOR UPSTREAM OF THE FGD SYSTEM. AN INPIRECT (STEAM COIL) HOT AIR INJECTION REHEAT SYSTEM WILL BE INCLUDED AT THE SCRUBBER OUTLET. DESIGN SULFUR DIOXIDE REMOVAL EFFICIENCY WILL BE 90 PERCENT
TENNESSEE VALLEY AUTHORITY CUMBERLAND RETROFIT 1300.0 MW (GROSS) 600.0 MW (ESC) COAL ***** %S BITUMINOUS PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 7/82	TVA INSTALLING A HEAVY-MEDIA COAL-CLEANING SYSTEM AND HAS AGREED TO INSTALL A 600-MW FGD SYSTEM AT THE CUMBERLAND PLANT TO BRING IT INTO COMPLIANCE WITH STATE AND FEDERAL SO2 EMISSION LIMITS. THE TYPE OF FGD SYSTEM CHOSEN WILL BE DETERMINED BY PROTOTYPE LEVEL EVALUATION OF SEVERAL ADVANCED SCRUBBER CONCEPTS.
TENNESSEE VALLEY AUTHORITY JOHNSONVILLE 1-10 RETROFIT 1450.0 MW (GROSS) 600.0 MW (ESC) COAL ***** %S MAGNESIUM OXIDE TVA/UNITED ENGINEERS ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/82	TVA IS PLANNING TO RETROFIT A 600-MW MAGNESIUM OXIDE FGD SYSTEM AT THE JOHNSONVILLE STEAM PLANT, A 1500-MW COAL-FIRED STATION. ENGINEERING ASSISTANCE WILL BE PROVIDED BY UNITED ENGINEERS. THIS PROJECT IS BUDGETTED AT $185 MILLION, INCLUDING THE COST OF A NEW 600-FT. STACK.
TENNESSEE VALLEY AUTHORITY PARADISE 1 RETROFIT 704.0 MW (GROSS) 704.0 MW (ESC) COAL ***** %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 6/82	TVA IS REQUESTING/EVALUATING BID SPECIFICATIONS FOR TWO LIMESTONE SLURRY FGD SYSTEMS WHICH WILL BE RETROFITTED ONTO TWO 650-MW HIGH SULFUR COAL-FIRED BOILERS AT THIS STATION. THE FGD SYSTEMS WILL TREAT 100% OF THE FLUE GASES FROM BOTH UNITS. TVA HAS PROJECTED THE TOTAL COST OF THE PARADISE FGD SYSTEMS TO BE APPROXIMATELY $220 MILLION ($170/KW). BID REQUEST WAS COMPLETED BY MID-NOVEMBER AND EVALUATION IS NOW IN PROCESS. BID EVALUATION IS EXPECTED TO BE COMPLETED BY JANUARY 1 AND A CONTRACT SHOULD BE AWARDED SHORTLY THEREAFTER.
TENNESSEE VALLEY AUTHORITY PARADISE 2 RETROFIT 704.0 MW (GROSS) 704.0 MW (ESC) COAL 4.20 %S LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 3/82	TVA IS REQUESTING/EVALUATING BID SPECIFICATIONS FOR TWO LIMESTONE SLURRY FGD SYSTEMS WHICH WILL BE RETROFITTED ONTO TWO 650-MW HIGH SULFUR COAL-FIRED BOILERS AT THIS STATION. THE FGD SYSTEMS WILL TREAT 100% OF THE FLUE GASES FROM BOTH UNITS. TVA HAS PROJECTED THE TOTAL COST OF THE PARADISE FGD SYSTEMS TO BE APPROXIMATELY $220 MILLION ($170/KW). BID REQUEST WAS COMPLETED BY MID-NOVEMBER AND EVALUATION IS NOW IN PROCESS. BID EVALUATION IS EXPECTED TO BE COMPLETED BY JANUARY 1 AND A CONTRACT SHOULD BE AWARDED SHORTLY THEREAFTER.
TENNESSEE VALLEY AUTHORITY SHAWNEE 10A RETROFIT 10.0 MW (GROSS) 10.0 MW (ESC) COAL 2.90 %S BITUMINOUS LIME/LIMESTONE AIR CORRECTION DIVISION, UOP ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/72	REFER TO THE BACKGROUND INFORMATION IN SECTION 3 OF THIS REPORT. THIS TURBULENT CONTACT ABSORBER (TCA) LIME/LIMESTONE SCRUBBING SYSTEM HAS BEEN OPERATIONAL SINCE APRIL 1972. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR. TEST DIRECTOR, AND REPORT WRITER. TESTING CHEMICAL ADDITIVES FOR IMPROVING SO2 REMOVAL EFFICIENCY CONTINUED THROUGH OCTOBER AND NOVEMBER. BOTH VENTURI/SPRAY TOWER AND TCA SYSTEMS WERE OPERATED ON LIMESTONE SLURRY WITH FLYASH LOADING.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TENNESSEE VALLEY AUTHORITY SHAWNEE 10P RETROFIT 10.0 MW (GROSS) 10.0 MW (ESC) COAL 2.90 %S BITUMINOUS LIME/LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 4/72	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS VENTURI/SPRAY TOWER LIME/LIMESTONE SCRUBBING SYSTEM HAS BEEN OPERATIONAL SINCE APRIL 1972. THIS TEST PROGRAM IS FUNDED BY THE EPA WITH TVA AS THE CONSTRUCTOR AND FACILITY OPERATOR. THE BECHTEL CORP. OF SAN FRANCISCO IS THE MAJOR CONTRACTOR, TEST DIRECTOR, AND REPORT WRITER. TESTING WITH CHEMICAL ADDITIVES FOR IMPROVING SO2 REMOVAL EFFICIENCY CONTINUED THROUGH OCTOBER AND NOVEMBER. BOTH VENTURI/SPRAY TOWER AND TCA SYSTEMS WERE OPERATED ON LIMESTONE SLURRY WITH HIGH FLYASH LOADING.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 7 RETROFIT 575.0 MW (GROSS) 575.0 MW (ESC) COAL 3.70 %S BITUMINOUS LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 10/80	TENNESSEE VALLEY AUTHORITY ANNOUNCED THAT A CONTRACT HAS BEEN AWARDED TO COMBUSTION ENGINEERING FOR A LIMESTONE SLURRY SPRAY TOWER FGD SYSTEM. THE FGD SYSTEM WILL TREAT HIGH SULFUR COAL FLUE GAS. THE SPRAY TOWER ABSORBERS WILL BE CONSTRUCTED OF 317L STAINLESS STEEL. THE NUMBER 7 UNIT FIRES COAL WITH THE SAME CHARACTERISTICS AS THE COAL FIRED IN UNIT 8. INITIAL OPERATIONS ARE SCHEDULED FOR OCTOBER 1980. THE FGD SYSTEM IS CURRENTLY UNDER CONSTRUCTION.
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK 8 RETROFIT 550.0 MW (GROSS) 550.0 MW (ESC) COAL 4.30 %S LIMESTONE TENNESSEE VALLEY AUTHORITY ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE EMISSION CONTROL SYSTEM FOR THIS 516 MW COAL-FIRED POWER GENERATING UNIT CONSISTS OF EXISTING ELECTROSTATIC PRECIPITATORS FOLLOWED BY FOUR PARALLEL SCRUBBING TRAINS, EACH CAPABLE OF HANDLING 25 PERCENT OF THE BOILER FLUE GAS FROM UNIT 8. EACH TRAIN INCLUDES A RECTANGULAR THROAT VENTURI SCRUBBER AND A GRID-TOWER ABSORBER SUPPLIED BY POLYCON. THE GRID TOWER CAN BE CONVERTED TO A MOBILE-BED TOWER IF GREATER SO2 REMOVAL IS REQUIRED.
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK 1 NEW 400.0 MW (GROSS) 400.0 MW (ESC) COAL 1.06 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	COMBUSTION ENGINEERING WAS AWARDED A CONTRACT TO DESIGN AND SUPPLY A 400-MW LIGNITE-FIRED BOILER, ESP, AND FGD SYSTEM AT GIBBONS CREEK STEAM ELECTRIC STATION UNIT NO. 1. THE BOILER WILL BURN 1.06% SULFUR LIGNITE. FLUE GAS WILL BE CLEANED OF PARTICULATES BY A COLD-SIDE ESP (99.73% EFFICIENCY). SO2 WILL BE REMOVED BY 3 SPRAY TOWER MODULES UTILIZING A LIMESTONE SLURRY (72.5 TO 87.5% EFFICIENCY). A CONTRACY HAS BEEN AWARDED TO IUCS FOR SLUDGE DISPOSAL. CONSTRUCTION IS TO BEGIN IN THE SPRING OF 1979. COMMERICAL START-UP IS SCHEDULED FOR JANUARY, 1982.
TEXAS POWER & LIGHT SANDOW 4 NEW 545.0 MW (GROSS) 382.0 MW (ESC) COAL 1.60 %S LIGNITE LIMESTONE COMBUSTION ENGINEERING ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 7/80	COMBUSTION ENGINEERING HAS BEEN CHOSEN AS THE BOILER AND FGD VENDOR FOR THIS UNIT. BOILER CONSTRUCTION BEGAN ON SEPTEMBER 9, 1977. PARTICULATE REMOVAL EQUIPMENT WILL BE LOCATED ON THE COLD-SIDE OF THE AIR HEATER. SOME PORTION OF THE FLUE GAS WILL BYPASS THE SCRUBBER FOR REHEAT. THE SPENT SLURRY WILL BE PONDED AND WATER RECYCLED. THE UNIT IS NOW APPROXIMATELY 35% COMPLETE.
TEXAS POWER & LIGHT TWIN OAKS 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 8/83	THIS UNIT WILL BE JOINTLY OWNED BY TP&L AND ALCOA. A FIRM DECISION HAS NOT BEEN MADE WHETHER TO INSTALL FGD FACILITIES. THIS IS PRIMARILY DUE TO THE FACT THAT SUCH A DECISION IS NOT YET REQUIRED IN THE UTILITIES PLANNING TIMETABLE

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TEXAS POWER & LIGHT TWIN OAKS 2 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE LIMESTONE VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	THIS UNIT WILL BE JOINTLY OWNED BY TP&L AND ALCOA. A FIRM DECISION HAS NOT BEEN MADE WHETHER TO INSTALL FGD FACILITIES. THIS IS PRIMARILY DUE TO THE FACT THAT SUCH A DECISION IS NOT YET REQUIRED IN THE UTILITIES PLANNING TIMETABLE
TEXAS UTILITIES FOREST GROVE 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 5 STARTUP 0/81	TEXAS UTILITIES IS PLANNING A NEW 750-MW UNIT AT THE FOREST GROVE SITE. TWO ESP'S WILL BE INSTALLED FOR PARTICULATE CONTROL. THE UTILITY IS CURRENTLY REQUESTING BIDS FOR AN FGD SYSTEM. START-UP IS SCHEDULED FOR LATE 1981. THE BOILER WILL BE SUPPLIED BY BABCOCK & WILCOX COMPANY. THE DESIGN DOES NOT INCLUDE A STACK GAS REHEAT SYSTEM.
TEXAS UTILITIES MARTIN LAKE 1 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 4/77	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS NEW 793 MW UNIT FIRES TEXAS LIGNITE CONTAINING 0.9% SULFUR (AVG) AND 8% ASH (AVG). THE UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM WHICH INCLUDES COLD-SIDE ESP'S AND A LIMESTONE FGD SYSTEM BOTH SUPPLIED BY RESEARCH-COTTRELL. THE FGD SYSTEM CONSISTS OF 6 PACKED/SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BYPASSED FOR REHEAT. TOTAL SO2 REMOVAL EFFICIENCY IS 70.5%. THE FLUE GAS CLEANING WASTES ARE STABILIZED AND DISPOSED IN AN ON-SITE, LANDFILL.
TEXAS UTILITIES MARTIN LAKE 2 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 5/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS NEW 793 MW UNIT FIRES TEXAS LIGNITE CONTAINING 0.9% SULFUR (AVG) AND 8% ASH (AVG). THE UNIT IS EQUIPPED WITH AN EMISSION CONTROL SYSTEM CONSISTING OF COLD-SIDE ESP'S AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH-COTTRELL. THE FGD SYSTEM CONSISTS OF 6 PACKED/SPRAY TOWER ABSORBERS WHICH TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING FLUE GAS IS BY-PASSED FOR REHEAT. TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5%. THE FLUE GAS CLEANING WASTES ARE STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL.
TEXAS UTILITIES MARTIN LAKE 3 NEW 793.0 MW (GROSS) 595.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: 1.3% STATUS 1 STARTUP 2/79	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THIS NEW 793-MW POWER GENERATING UNIT WILL FIRE TEXAS LIGNITE CONTAINING 0.9% SULFUR (AVG.) AND 8% ASH (AVG.). TO MEET FEDERAL NSPS, THE BE EQUIPPED WITH AN EMISSION CONTROL SYSTEM CONSISTING OF COLD-SIDE ESP'S AND A LIMESTONE FGD SYSTEM, BOTH SUPPLIED BY RESEARCH-COTTRELL. THE FGD SYSTEM CONSISTS OF 6 PACKED/SPRAY TOWER ABSORBERS WHICH WILL TREAT 75% OF THE TOTAL BOILER FLUE GAS. THE REMAINING GAS WILL BE BYPASSED FOR REHEAT. TOTAL DESIGN SO2 REMOVAL EFFICIENCY IS 70.5% THE FLUE GAS CLEANING WASTES WILL BE STABILIZED AND DISPOSED IN AN ON-SITE LANDFILL.
TEXAS UTILITIES MARTIN LAKE 4 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL .90 %S LIGNITE LIMESTONE RESEARCH COTTRELL ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 0/85	THE CONTRACT FOR THIS FGD SYSTEM HAS BEEN AWARDED TO RESEARCH-COTTRELL. THE BOILER IS NOW BEING ERECTED. START-UP HAS BEEN DELAYED TO EITHER 1985 OR 1986.

SECTION 2
STATUS OF FGD SYSTEMS

UNIT IDENTIFICATION	ABSTRACT
TEXAS UTILITIES MILL CREEK 1 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/85	TEXAS UTILITIES IS PLANNING TWO NEW 750-MW UNITS FOR THE UTILITY'S MILL CREEK SITE. THE UTILITY WILL INCORPORATE FGD SYSTEMS ON EACH UNIT SO THAT SO2 EMISSIONS WILL BE CONTROLLED TO APPROXIMATELY 1LB/MM BTU. PARTICULATE MATTER WILL BE CONTROLLED BY ESP'S. START-UP FOR UNITS 1 AND2 ARE PROJECTED TO BE 1985 AND 1986 RESPECTIVELY.
TEXAS UTILITIES MILL CREEK 2 NEW 750.0 MW (GROSS) 750.0 MW (ESC) COAL ***** %S LIGNITE PROCESS NOT SELECTED VENDOR NOT SELECTED ENERGY CONSUMPTION: ****% STATUS 6 STARTUP 0/86	TEXAS UTILITIES IS PLANNING TWO NEW 750-MW UNITS FOR THE UTILITY'S MILL CREEK SITE. THE UTILITY WILL INCORPORATE FGD SYSTEMS ON EACH UNIT SO THAT SO2 EMISSIONS WILL BE CONTROLLED TO APPROXIMATELY 1 LB/MM BTU. PARTICULATE MATTER WILL BE CONTROLLED BY ESP'S. START-UP FOR UNITS 1 AND 2 ARE PROJECTED TO BE 1965 AND 1986 RESPECTIVELY.
TEXAS UTILITIES MONTICELLO 3 NEW 800.0 MW (GROSS) 800.0 MW (ESC) COAL 1.50 %S LIGNITE LIMESTONE CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. THE EMISSION CONTROL SYSTEM FOR THIS UNIT CONSISTS OF A HIGH EFFICIENCY ESP AND A LIMESTONE FGD SYSTEM. THE ESP (POLLUTION CONTROL-WALTHER) PROVIDES PRIMARY PARTICULATE CONTROL (99.56%). THE FGD SYSTEM CONSISTS OF 3 LIMESTONE SCRUBBING SPRAY TOWERS THAT PROVIDE PRIMARY SO2 CONTROL (74%). THE FGD SYSTEM IS DESIGNED TO TREAT 3 MM ACFM OF FLUE GAS RESULTING FROM COAL WITH 1.5% SULFUR, 18.9% ASH AND 0.04% CL. THE FLUE GAS CLEANING WASTES ARE DISPOSED IN AN ON-SITE LINED POND.
UTAH POWER & LIGHT HUNTER 1 NEW 400.0 MW (GROSS) 360.0 MW (ESC) COAL .55 %S LIME CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/79	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. A CONTRACT HAS BEEN AWARDED TO THE CHEMICO AIR POLLUTION DIVISION FOR A PEBBLE LIME WET SCRUBBING SYSTEM FOR THIS NEW UNIT. THE SCRUBBING SYSTEM IS DESIGNED TO OPERATE IN AN OPEN WATER LOOP MODE WITH AN SO2 REMOVAL EFFICIENCY OF 80 PERCENT FOR LOW SULFUR UTAH COAL. PRIMARY PARTICULATE CONTROL WILL BE PROVIDED BY AN ESP UPSTREAM OF THE SCRUBBERS. THE SLUDGE WILL BE STABILIZED WITH FLYASH AND DISPOSED OF ON THE PLANT SITE. THE A-E DESIGN FIRM FOR THIS PROJECT IS STEARNS-ROGER. CONSTRUCTION IS NOW
UTAH POWER & LIGHT HUNTER 2 NEW 400.0 MW (GROSS) 360.0 MW (ESC) COAL .55 %S LIME CHEMICO ENERGY CONSUMPTION: ****% STATUS 2 STARTUP 6/80	UTAH P&L AWARDED CHEMICO A CONTRACT TO SUPPLY A LIME FGD SYSTEM FOR EMERY 2 DESIGNED TO OPERATE IN AN OPEN WATER LOOP MODE WITH AN SO2 REMOVAL EFFICIENCY OF 80 PERCENT (FIRING LOW SULFUR UTAH COAL). PRIMARY PARTICULATE CONTROL WILL BE PROVIDED BY AN ESP UP-STREAM OF THE SCRUBBERS, THE SLUDGE WILL BE STABILIZED WITH FLYASH AND DISPOSED OF ON THE PLANT SITE. INITIAL BOILER AND FGD SYSTEM START-UP IS SCHEDULED FOR JUNE 1980. THIS UNIT WILL BE IDENTICAL TO UNIT 1. CONSTRUCTION ON THIS UNIT IS ABOUT 50% COMPLETE.
UTAH POWER & LIGHT HUNTINGTON 1 NEW 430.0 MW (GROSS) 366.0 MW (ESC) COAL .55 %S LIME CHEMICO ENERGY CONSUMPTION: ****% STATUS 1 STARTUP 5/78	REFER TO SECTION 3 OF THIS REPORT FOR ADDITIONAL INFORMATION. CHEMICO WAS THE SUPPLIER OF A LIME SCRUBBING SYSTEM FOR THIS NEW UNIT. PRIMARY PARTICULATE REMOVAL IS PROVIDED BY AN ESP INSTALLED UPSTREAM OF THE WET SCRUBBING SYSTEM. A DAMPER IS USED DURING OPERATION TO ALLOW BETWEEN 10 AND 20 PERCENT OF THE FLUE GAS TO BY-PASS THE FGD SYSTEM. DESIGN REMOVAL EFFICIENCIES FOR SO2 AND PARTICULATE ARE 80 AND 99.5 PERCENT RESPECTIVELY. SLUDGE IS DEWATERED (60% SOLIDS) AND TRUCKED TO AN ON-SITE LANDFILL. INITIAL OPERATIONS AT THIS UNIT BEGAN ON MAY 10, 1978.

UNIT IDENTIFICATION	ABSTRACT
WISCONSIN POWER & LIGHT COLUMBIA 2 RETROFIT 527.0 MW (GROSS) 316.0 MW (ESC) COAL .80 %S LIME/ALKALINE FLYASH CHEMICO ENERGY CONSUMPTION: ****% STATUS 3 STARTUP 1/82	A CONTRACT HAS BEEN AWARDED TO CHEMICO FOR A LIME/FLYASH FGD SYSTEM. IT WILL CONSIST OF TWO SPRAY MODULES WITH A HOT-SIDE ESP FOR PARTICULATE REMOVAL. A CLOSED LOOP WATER SYSTEM IS ANTICIPATED WITH FLYASH STABILIZATION OF THE SLUDGE. A SLUDGE DISPOSAL POND LOCATED OFF-SITE IS BEING CONSIDERED. THE FGD SYSTEM IS BEING DESIGNED TO TREAT 60% OF THE FLUE GAS RESULTING FROM THE COMBUSTION OF LOW SULFUR COLSTRIP COAL. THE REMAINING 40% WILL BE BYPASSED FOR REHEAT.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

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COMPANY NAME                                      ALABAMA ELECTRIC COOP
PLANT NAME                                        TOMBIGBEE
UNIT NUMBER                                       2
CITY                                              LEROY
STATE                                             ALABAMA
GROSS UNIT GENERATING CAPACITY - MW                  255.0
NET UNIT GENERATING CAPACITY W/FGD - MW              235.0
EQUIVALENT SCRUBBED CAPACITY - MW                    179.0

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    BITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG                  26749.         ( 11500 BTU/LB)
    AVERAGE ASH CONTENT - %                          14.00
    AVERAGE MOISTURE CONTENT - %                      7.00
    AVERAGE SULFUR CONTENT - %                        1.15
    AVERAGE CHLORIDE CONTENT - %                  ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                          WET SCRUBBING
    PROCESS TYPE                                  LIMESTONE
    SYSTEM SUPPLIER                               PEABODY PROCESS SYSTEMS
    NEW/RETROFIT                                  NEW
    ENERGY CONSUMPTION - %                            3.1
    INITIAL START-UP DATE                          9/78
    COMMERCIAL START-UP DATE                      **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        99.30

** WATER LOOP
    TYPE                                          OPEN
    FRESH MAKE-UP WATER - LITER/S                    17.6        (  280 GPM)

** DISPOSAL
    TYPE                                          LINED POND


-------------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS  HOURS HOURS FACTOR
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 2/79  SYSTEM
                                                                           672
 3/79  SYSTEM
                                                                           744
 4/79  SYSTEM
                                                                           720
     ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  2/79        END DATE  4/79
                    THE UTILITY HAS REPORTED THAT NO UNUSUAL PROBLEMS HAVE OCCURRED.
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COMPANY NAME	ALLEGHENY POWER SYSTEM	
PLANT NAME	PLEASANTS	
UNIT NUMBER	1	
CITY	BELMONT	
STATE	WEST VIRGINIA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*******	
GROSS UNIT GENERATING CAPACITY - MW	625.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	625.0	
NET UNIT GENERATING CAPACITY WO/FGD - MW	*******	
EQUIVALENT SCRUBBED CAPACITY - MW	519.0	
** BOILER DATA		
SUPPLIER	******	
TYPE	******	
SERVICE LOAD	BASE	
COMMERCIAL SERVICE DATE	**/**	
MAXIMUM BOILER FLUE GAS FLOW - CU.M/S	1152.85	(2443000 ACFM)
FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	366.	(1200 FT)
STACK TOP DIAMETER - M	*******	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	*******	(****** BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11,000-13,300
AVERAGE ASH CONTENT - %	********	
RANGE ASH CONTENT - %	******	
AVERAGE MOISTURE CONTENT - %	********	
RANGE MOISTURE CONTENT - %	10-20	
AVERAGE SULFUR CONTENT - %	4.50	
RANGE SULFUR CONTENT - %	2-4.5	
AVERAGE CHLORIDE CONTENT - %	********	
RANGE CHLORIDE CONTENT - %	******	
FUEL FIRING RATE - M T/H	*******	(*** TPH)
FUEL FIRING RATE - MW	*****	
** ESP		
NUMBER	1	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
** FGD SYSTEM		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	MG/2-6%	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
A-E FIRM	UNITED ENGINEERS AND CONTRACTORS	
DEVELOPMENT LEVEL	FULL-SCALE	
NEW/RETROFIT	NEW	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.55	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
COMMERCIAL DATE	3/79	
INITIAL START-UP	3/79	
** ABSORBER		
NUMBER	4	
TYPE	SPRAY TOWER	
INITIAL START UP	3/79	
NUMBER OF STAGES	1	
BOILER LOAD/ABSORBER - %	83.5	
GAS TEMPERATURE - C	132.2	(270 F)
** REHEATER		
TYPE	BYPASS	
TEMPERATURE BOOST - C	11.1	(20 F)

** WATER LOOP

TYPE OPEN

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 4/79

THE UNIT STARTED ON MARCH 7 1979. NO HOURS ARE YET AVAILABLE BECAUSE OF THE RECENT OPERATING STATUS.

START DATE 3/79 END DATE 4/79

A MODULE HAS BEEN REMOVED FROM SERVICE DUE TO A WELD FAILURE ON THE ABSORBER DOWNCOMER.

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                                        SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
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 COMPANY NAME                                       ARIZONA ELECTRIC POWER COOP
 PLANT NAME                                         APACHE
 UNIT NUMBER                                        2
 CITY                                               COCHISE
 STATE                                              ARIZONA
 GROSS UNIT GENERATING CAPACITY - MW                   195.0
 NET UNIT GENERATING CAPACITY W/FGD - MW               175.0
 EQUIVALENT SCRUBBED CAPACITY - MW                     195.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     BITUMINOUS
     AVERAGE HEAT CONTENT - KJ/KG                   ******         (****** BTU/LB)
     AVERAGE ASH CONTENT - %                           10.00
     AVERAGE MOISTURE CONTENT - %                   ********
     AVERAGE SULFUR CONTENT - %                          .70
     AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIMESTONE
     SYSTEM SUPPLIER                                RESEARCH COTTRELL
     NEW/RETROFIT                                   NEW
     ENERGY CONSUMPTION - %                             4.1
     INITIAL START-UP DATE                           8/78
     COMMERCIAL START-UP DATE                        1/79
     SO2 DESIGN REMOVAL EFFICIENCY - %                 85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.50

 ** WATER LOOP
     TYPE                                           OPEN
     FRESH MAKE-UP WATER - LITER/S                    115.9        ( 1840 GPM)

 ** DISPOSAL
     TYPE                                           SLUDGE POND


-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                              672

 3/79  SYSTEM                                                              744

 4/79  SYSTEM                                                              720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE   2/79        END DATE  4/79
                         COMPLIANCE TESTS WERE RUN ON THIS UNIT LAST NOVEMBER AND THE UNIT WAS
                         DECLARED COMMERCIAL IN FEBRUARY.  THE FGD SYSTEM OPERATES ONLY ABOUT 50
                         PERCENT OF THE BOILER HOURS BECAUSE THE UNIT OPERATES AT SUCH A LOW
                         RATING 50 PERCENT OF THE TIME THAT THE FGD SYSTEM IS NOT NEEDED.

            START DATE   2/79        END DATE  3/79
                         A BOILER EXPLOSION AT THE BURNER FACE CAUSED THE UNIT TO BE DOWN FROM THE
                         LAST WEEK IN FEBRUARY THROUGH THE MIDDLE OF MARCH.
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SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	ARIZONA PUBLIC SERVICE	
PLANT NAME	CHOLLA	
UNIT NUMBER	1	
CITY	JOSEPH CITY	
STATE	ARIZONA	
GROSS UNIT GENERATING CAPACITY - MW	119.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	115.0	
EQUIVALENT SCRUBBED CAPACITY - MW	119.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	23609.	(10150 BTU/LB)
AVERAGE ASH CONTENT - %	13.50	
AVERAGE MOISTURE CONTENT - %	15.00	
AVERAGE SULFUR CONTENT - %	.50	
AVERAGE CHLORIDE CONTENT - %	.02	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	4.2	
INITIAL START-UP DATE	10/73	
COMMERCIAL START-UP DATE	12/73	
SO2 DESIGN REMOVAL EFFICIENCY - %	58.50	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.70	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	7.6	(120 GPM)
** DISPOSAL		
TYPE	UNLINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	A		88.2	68.1	88.2						
	B		85.6	88.3	85.6						
	SYSTEM		86.9	88.2	86.9			744	744	647	
1/79	A		99.2	99.1	99.2						
	B		100.0	100.0	100.0						
	SYSTEM		99.6	99.6	99.6			744	744	741	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/78 END DATE 1/79

THE UTILITY HAS REPORTED THAT THE FGD SYSTEM EXPERIENCED CONTROL PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A		100.0	100.0	100.0						
	B		100.0	100.0	100.0						
	SYSTEM		100.0	100.0	100.0			672	672	672	
3/79	A		95.3	95.0	95.3						
	B		100.0	100.0	100.0						
	SYSTEM		97.7	97.5	97.7			744	744	727	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79

THE UTILITY HAS EXPERIENCED PLUGGED REHEAT TUBES. THE OLD TUBES, IN UNSECTIONALIZED BUNDLES, WERE REPLACED WITH NEW TUBES OF SPLIT COIL CON-

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
			STRUCTION AND MADE OF 316L SS. THE NEW TYPE OF TUBES ALONG WITH BETTER MAINTENANCE PROCEEDURES HAS ADDED TO THE REHEAT TUBE LIFE AND AVAILABILITY.								
4/79	A		100.0	100.0	100.0						
	B		100.0	100.0	100.0						
	SYSTEM		100.0	100.0	100.0			720	720	720	

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
----------------------------------------------------------------------------------------------------------
 COMPANY NAME                                         ARIZONA PUBLIC SERVICE
 PLANT NAME                                           CHOLLA
 UNIT NUMBER                                          2
 CITY                                                 JOSEPH CITY
 STATE                                                ARIZONA
 GROSS UNIT GENERATING CAPACITY - MW                    350.0
 NET UNIT GENERATING CAPACITY W/FGD - MW                250.0
 EQUIVALENT SCRUBBED CAPACITY - MW                      350.0

 ** FUEL DATA
     FUEL TYPE                                        COAL
     FUEL GRADE                                       SUBBITUMINOUS
     AVERAGE HEAT CONTENT - KJ/KG                     23609.        ( 10150 BTU/LB)
     AVERAGE ASH CONTENT - %                             13.50
     AVERAGE MOISTURE CONTENT - %                        15.00
     AVERAGE SULFUR CONTENT - %                            .50
     AVERAGE CHLORIDE CONTENT - %                          .02

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                             WET SCRUBBING
     PROCESS TYPE                                     LIMESTONE
     SYSTEM SUPPLIER                                  RESEARCH COTTRELL
     NEW/RETROFIT                                     NEW
     ENERGY CONSUMPTION - %                           *******
     INITIAL START-UP DATE                             4/78
     COMMERCIAL START-UP DATE                         **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %                   75.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %           99.70

 ** WATER LOOP
     TYPE                                             OPEN
     FRESH MAKE-UP WATER - LITER/S                        7.6       (  120 GPM)

 ** DISPOSAL
     TYPE                                             SLUDGE POND


-----------------------------------------PERFORMANCE DATA-------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ -----  ------

12/78  SYSTEM                                                              744

 1/79  SYSTEM                                                              744

 2/79  SYSTEM                                                              672

 3/79  SYSTEM                                                              744

 4/79  SYSTEM                                                              720

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE 12/78         END DATE  4/79
                         OPERATION PARAMATERS ARE STILL UNAVAILABLE FOR THIS UNIT.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	CENTRAL ILLINOIS LIGHT	
PLANT NAME	DUCK CREEK	
UNIT NUMBER	1	
CITY	CANTON	
STATE	ILLINOIS	
GROSS UNIT GENERATING CAPACITY - MW	416.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	378.0	
EQUIVALENT SCRUBBED CAPACITY - MW	416.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	24423.	(10500 BTU/LB)
AVERAGE ASH CONTENT - %	9.12	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	3.30	
AVERAGE CHLORIDE CONTENT - %	.03	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RILEY STOKER/ENVIRONEERING	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	2.9	
INITIAL START-UP DATE	7/76	
COMMERCIAL START-UP DATE	8/78	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.80	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	37.8	(600 GPM)
** DISPOSAL		
TYPE	LINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	A	23.0	25.0	25.0	23.0						
	B	26.0	28.0	28.0	26.0						
	C	21.0	23.0	23.0	21.0						
	D	10.0	11.0	11.0	10.0						
	SYSTEM	20.0	21.0	21.0	20.0			744	706	151	66.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 12/78 END DATE 12/78
ISOLATION DAMPER FAILURES AND SLURRY RECYCLE DISCHARGE VALVE FAILURES OCCURRED DURING DECEMBER.

START DATE 12/78 END DATE 12/78
LIMESTONE MILL PROBLEMS AND PLUGGED LIMESTONE FEEDER HAMPERED SCRUBBER OPERATIONS DURING DECEMBER.

START DATE 12/78 END DATE 12/78
FROZEN INSTRUMENT CONTROL LINES WERE A PROBLEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/79	A	.0	.0	.0	.0						
	B	.0	.0	.0	.0						
	C	.0	.0	.0	.0						
	D	.0	.0	.0	.0						
	SYSTEM	.0	.0	.0	.0			744	738	0	

```
------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  1/79         END DATE  1/79
                         FROZEN INSTRUMENT CONTROL LINES, RECYCLE TANK SUCTION LINES, MAIN MODULE
                         DRAIN LINES AND MIST ELIMINATOR DRAIN LINES WERE MAJOR PROBLEM AREAS
                         DURING JANUARY.

             START DATE  1/79         END DATE  1/79
                         SLURRY RECYCLE VALVE PLUGGAGE AND SLURRY TRANSFER PUMP FAILURE CONTRIBUTED
                         TO FGD SYSTEM OUTAGE.

 2/79  A              .0          .0          .0          .0
       B              .0          .0          .0          .0
       C              .0          .0          .0          .0
       D              .0          .0          .0          .0
       SYSTEM         .0          .0          .0          .0                   672   533     0  80.5

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  2/79         END DATE  2/79
                         RECYCLE PUMP SUCTION VALVE FAILURES AND A SLURRY TRANSFER PUMP FAILURE
                         CONTRIBUTED TO THE LOW OPERATION PARAMETERS OF THE FGD SYSTEM.

             START DATE  2/79         END DATE  2/79
                         FROZEN MIST ELIMINATOR DRAINS, ABSORBER DRAINS AND INSTRUMENT LINES WERE
                         A MAJOR PROBLEM DURING FEBRUARY.

 3/79  A            33.7        31.1        31.1        31.1
       B             6.7         6.7         6.7         6.7
       C
       D              .0          .0          .0          .0
       SYSTEM       10.1         9.4         9.4         9.4                   744   744    70

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  3/79         END DATE  3/79
                         FREEZING PROBLEMS CONTINUED TO HAMPER FGD OPERATIONS DURING MARCH.

             START DATE  3/79         END DATE  3/79
                         BROKEN MIST ELIMINATOR SPAY LINES AND PLUGGED MIST ELIMINATOR NOZZLES
                         WERE PROBLEM AREAS DURING MARCH.

             START DATE  3/79         END DATE  3/79
                         RECYCLE PUMP FAILURES AND WASTE WATER PUMP FAILURES WERE EXPERIENCED DUR
                         ING MARCH.

             START DATE  3/79         END DATE  3/79
                         PLUGGED SLURRY NOZZLES AND GENERAL INSTRUMENTATION PROBLEMS WERE REPORTED
                         BY THE UTILITY.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC.	
PLANT NAME	CONESVILLE	
UNIT NUMBER	5	
CITY	CONESVILLE	
STATE	OHIO	
GROSS UNIT GENERATING CAPACITY - MW	411.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	375.0	
EQUIVALENT SCRUBBED CAPACITY - MW	411.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	25237.	(10850 BTU/LB)
AVERAGE ASH CONTENT - %	15.10	
AVERAGE MOISTURE CONTENT - %	7.50	
AVERAGE SULFUR CONTENT - %	4.67	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	3.9	
INITIAL START-UP DATE	1/77	
COMMERCIAL START-UP DATE	2/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	89.50	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.60	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	31.5	(500 GPM)
** TREATMENT		
TYPE	PROPRIETARY (POZ-O-TEC)	
** DISPOSAL		
TYPE	LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A	.0	.0	.0	.0						
	B	.0	.0	.0	.0						
	SYSTEM	.0	.0	.0	.0			672		0	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79
THE LOW OPERATING HOURS FOR FEBRUARY WERE CAUSED BY SEVERE WINTER WEATHER.

START DATE 0/ 0 END DATE 0/ 0
THE LOW OPERATING HOURS FOR FEBRUARY WERE CAUSED BY SEVERE WINTER WEATHER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	A	50.0	49.0	50.0	43.0						
	B	.0	.0	.0	.0						
	SYSTEM	25.0	24.5	25.0	21.5			744	652	160	
4/79	A	17.0	58.0	73.0	12.0						
	B	.0	.0	.0	.0						
	SYSTEM	8.5	29.0	36.5	6.0			720	149	43	

```
-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  3/79        END DATE  4/79
                         THE LOW OPERATING HOURS REPORTED FOR MODULE B IS DUE TO SEVERE CORROSION
                         AT THE PRESATURATOR INLET DUCT WHICH UOP HAS BEEN REPAIRING SINCE MARCH.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	COLUMBUS & SOUTHERN OHIO ELEC.	
PLANT NAME	CONESVILLE	
UNIT NUMBER	6	
CITY	CONESVILLE	
STATE	OHIO	
GROSS UNIT GENERATING CAPACITY - MW	411.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	375.0	
EQUIVALENT SCRUBBED CAPACITY - MW	411.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	25237.	(10850 BTU/LB)
AVERAGE ASH CONTENT - %	15.10	
AVERAGE MOISTURE CONTENT - %	7.50	
AVERAGE SULFUR CONTENT - %	4.67	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	3.9	
INITIAL START-UP DATE	6/78	
COMMERCIAL START-UP DATE	6/78	
SO2 DESIGN REMOVAL EFFICIENCY - %	89.50	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.60	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	31.5	(500 GPM)
** TREATMENT		
TYPE	PROPRIETARY (POZ-O-TEC)	
** DISPOSAL		
TYPE	DIKED LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	A	.0	.0	.0	.0						
	B	.0	.0	.0	.0						
	SYSTEM	.0	.0	.0	.0			672		0	
3/79	A	43.0	37.0	39.0	33.0						
	B	32.0	28.0	29.0	25.0						
	SYSTEM	37.5	32.5	34.0	29.0			744	664	216	
4/79	A	82.0	79.0	79.0	78.0						
	B	72.0	59.0	59.0	58.0						
	SYSTEM	77.0	69.0	69.0	68.0			720	711	489	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79

THE LOW FEBRUARY PARAMETERS WERE BLAMED ON SEVERE WINTER WEATHER.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
COMPANY NAME                                    DUQUESNE LIGHT
PLANT NAME                                      ELRAMA
UNIT NUMBER                                     1-4
CITY                                            ELRAMA
STATE                                           PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW                510.0
NET UNIT GENERATING CAPACITY W/FGD - MW            475.0
EQUIVALENT SCRUBBED CAPACITY - MW                  510.0

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  ******
    AVERAGE HEAT CONTENT - KJ/KG                26400.         ( 11350 BTU/LB)
    AVERAGE ASH CONTENT - %                        21.00
    AVERAGE MOISTURE CONTENT - %                ********
    AVERAGE SULFUR CONTENT - %                      2.20
    AVERAGE CHLORIDE CONTENT - %                ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                        WET SCRUBBING
    PROCESS TYPE                                LIME
    SYSTEM SUPPLIER                             CHEMICO
    NEW/RETROFIT                                RETROFIT
    ENERGY CONSUMPTION - %                         3.5
    INITIAL START-UP DATE                       10/75
    COMMERCIAL START-UP DATE                    10/75
    SO2 DESIGN REMOVAL EFFICIENCY - %              83.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.00

** WATER LOOP
    TYPE                                        OPEN
    FRESH MAKE-UP WATER - LITER/S               *******        (***** GPM)

** TREATMENT
    TYPE                                        POZ-O-TEC

** DISPOSAL
    TYPE                                        LANDFILL
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
COMPANY NAME                                        DUQUESNE LIGHT
PLANT NAME                                          PHILLIPS
UNIT NUMBER                                         1-6
CITY                                                SOUTH HEIGHT
STATE                                               PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW                   410.0
NET UNIT GENERATING CAPACITY W/FGD - MW               377.0
EQUIVALENT SCRUBBED CAPACITY - MW                     410.0

** FUEL DATA
    FUEL TYPE                                       COAL
    FUEL GRADE                                      ******
    AVERAGE HEAT CONTENT - KJ/KG                    26400.         ( 11350 BTU/LB)
    AVERAGE ASH CONTENT - %                            18.20
    AVERAGE MOISTURE CONTENT - %                    ********
    AVERAGE SULFUR CONTENT - %                          2.00
    AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                            WET SCRUBBING
    PROCESS TYPE                                    LIME
    SYSTEM SUPPLIER                                 CHEMICO
    NEW/RETROFIT                                    RETROFIT
    ENERGY CONSUMPTION - %                              2.4
    INITIAL START-UP DATE                            7/73
    COMMERCIAL START-UP DATE                        **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                  83.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.00

** WATER LOOP
    TYPE                                            OPEN
    FRESH MAKE-UP WATER - LITER/S                   *******        (***** GPM)

** TREATMENT
    TYPE                                            POZ-O-TEC

** DISPOSAL
    TYPE                                            LANDFILL
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	GULF POWER	
PLANT NAME	SCHOLZ	
UNIT NUMBER	1,2	
CITY	SNEADS	
STATE	FLORIDA	
GROSS UNIT GENERATING CAPACITY - MW	23.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	23.0	
EQUIVALENT SCRUBBED CAPACITY - MW	23.0	
**** FUEL DATA**		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	29075.	(12500 BTU/LB)
AVERAGE ASH CONTENT - %	11.00	
AVERAGE MOISTURE CONTENT - %	5.00	
AVERAGE SULFUR CONTENT - %	2.50	
AVERAGE CHLORIDE CONTENT - %	********	
**** FGD SYSTEM**		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE/THOROUGHBRED 121	
SYSTEM SUPPLIER	CHIYODA INTERNATIONAL	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	8/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
**** WATER LOOP**		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
**** BYPRODUCT**		
BYPRODUCT NATURE	GYPSUM	
DISPOSITION	STACKED IN POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM		98.3		98.4			672	672	661	
3/79	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	
4/79	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
ONE PUMP FAILURE CAUSING A 5 MINUTE OUTAGE WAS REPORTED BY THE UTILITY.

START DATE 4/79 END DATE 4/79
HIGH PARTICULATE LOADING TESTS WERE DONE IN APRIL. THE ESP WAS TOTALLY SHUT DOWN. THE SO2 REMOVAL WAS NOT AFFECTED BUT THE GYPSUM PRODUCT WAS TEMPORARILY AFFECTED. HIGH CHLORIDE TESTS WERE ALSO PERFORMED BY ADDING CALCIUM CHLORIDE TO THE SYSTEM. A RESULTANT CONCENTRATION OF 6000 PPM CHLORIDE WAS FOUND IN THE UNDERFLOW. NO SIGNIFICANT SCALING WAS ENCOUNTERED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	INDIANAPOLIS POWER & LIGHT	
PLANT NAME	PETERSBURG	
UNIT NUMBER	3	
CITY	PETERSBURG	
STATE	INDIANA	
GROSS UNIT GENERATING CAPACITY - MW	532.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	515.0	
EQUIVALENT SCRUBBED CAPACITY - MW	532.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	25004.	(10750 BTU/LB)
AVERAGE ASH CONTENT - %	********	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	3.25	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	2.4	
INITIAL START-UP DATE	12/77	
COMMERCIAL START-UP DATE	12/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.30	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	55.6	(882 GPM)
** DISPOSAL		
TYPE	UNLINED POND	

```
-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL  PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

2/79   SYSTEM                                                               672

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  2/79
                        THE UTILIZATION FIGURES GIVEN BELOW ARE FOR THE PERIOD SEPTEMBER-DECEMBER 1

3/79   A                                           31.2
       B                                           30.0
       C                                           48.0
       D                                           48.0
       SYSTEM                                      39.0                     744           715

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  1/79        END DATE  3/79
                        THE FGD SYSTEM WAS DOWN FROM JANUARY 1 TO MARCH 15 DUE TO SEVERE WINTER
                        WEATHER.

4/79   SYSTEM                                                               722

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  5/79
                        DUE TO THE FORMER SHELL LINING PEELING AWAY, THE STEEL
                        SHELL WAS SAND BLASTED AND RIGIFLAKE 4850 APPLYED BY TROWEL.
```

INDIANAPOLIS POWER & LIGHT (CONT.)

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----------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

            START DATE  4/79        END DATE  5/79
                        ALL MIST ELIMINATORS WERE CLEANED DUE TO SEVERE SCALING PROBLEMS.

            START DATE  4/79        END DATE  5/79
                        EXTENSIVE REPAIRS WERE MADE TO THE INLET DAMPERS, THE OUTLET DUCTS WERE
                        LINED WITH RESISTIFLAKE 1150, AND MAJOR REPAIRS WERE MADE TO BONNETS
                        BECAUSE OF ACID CORROSION.

            START DATE  4/79        END DATE  5/79
                        THE SYSTEM HAS BEEN DOWN SINCE MID-MARCH FOR INSPECTION AND MAINTENANCE.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT
PLANT NAME	HAWTHORN
UNIT NUMBER	3
CITY	KANSAS CITY
STATE	MISSOURI
GROSS UNIT GENERATING CAPACITY - MW	90.0
NET UNIT GENERATING CAPACITY W/FGD - MW	85.0
EQUIVALENT SCRUBBED CAPACITY - MW	90.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - KJ/KG	22795. (9800 BTU/LB)
AVERAGE ASH CONTENT - %	11.00
AVERAGE MOISTURE CONTENT - %	********
AVERAGE SULFUR CONTENT - %	.60
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	2.2
INITIAL START-UP DATE	11/72
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	70.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	******* (***** GPM)
** TREATMENT	
TYPE	SOME STABILIZATION FROM FLYASH
** DISPOSAL	
TYPE	UNLINED POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 1/79 END DATE 3/79
OPERATING INFORMATION IS STILL NOT AVAILABLE FOR UNIT 3

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM	18.0						720	130	130	9.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 4/79
THE BOILER WAS DOWN IN APRIL FOR 543 HOURS FOR TURBINE OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM	55.0						744	409	409	29.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 5/79
IN MAY THE OUTAGE TIME WAS DUE TO BOILER TUBE LEAKS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	HAWTHORN	
UNIT NUMBER	4	
CITY	KANSAS CITY	
STATE	MISSOURI	
GROSS UNIT GENERATING CAPACITY - MW	90.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	85.0	
EQUIVALENT SCRUBBED CAPACITY - MW	90.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	22795.	(9800 BTU/LB)
AVERAGE ASH CONTENT - %	11.00	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	.60	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	2.2	
INITIAL START-UP DATE	8/72	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	70.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** TREATMENT		
TYPE	SOME STABILIZATION FROM FLYASH	
** DISPOSAL		
TYPE	UNLINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 1/79 END DATE 3/79
OPERATING INFORMATION FOR UNIT 4 IS STILL NOT AVAILABLE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM	57.0						720	410	410	30.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 4/79
AN EXCITER FAILURE ON THE GENERATOR CAUSED THE APRIL OUTAGE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/79	SYSTEM	94.0						744	699	699	49.0

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 5/79 END DATE 5/79
MAY OUTAGE TIME WAS FOR SCRUBBER CLEANING AND GENERAL MAINTENANCE.

```
                                                SECTION 3
                         DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
---------------------------------------------------------------------------------------------------

  COMPANY NAME                                       KANSAS CITY POWER & LIGHT
  PLANT NAME                                         LA CYGNE
  UNIT NUMBER                                        1
  CITY                                               LA CYGNE
  STATE                                              KANSAS
  GROSS UNIT GENERATING CAPACITY - MW                  874.0
  NET UNIT GENERATING CAPACITY W/FGD - MW              820.0
  EQUIVALENT SCRUBBED CAPACITY - MW                    874.0

  ** FUEL DATA
      FUEL TYPE                                      COAL
      FUEL GRADE                                     SUBBITUMINOUS
      AVERAGE HEAT CONTENT - KJ/KG                   21913.        ( 9421 BTU/LB)
      AVERAGE ASH CONTENT - %                           24.36
      AVERAGE MOISTURE CONTENT - %                       8.60
      AVERAGE SULFUR CONTENT - %                         5.39
      AVERAGE CHLORIDE CONTENT - %                        .03

  ** FGD SYSTEM
      GENERAL PROCESS TYPE                           WET SCRUBBING
      PROCESS TYPE                                   LIMESTONE
      SYSTEM SUPPLIER                                BABCOCK & WILCOX
      NEW/RETROFIT                                   NEW
      ENERGY CONSUMPTION - %                             2.7
      INITIAL START-UP DATE                           2/73
      COMMERCIAL START-UP DATE                        6/73
      SO2 DESIGN REMOVAL EFFICIENCY - %                 80.00
      PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.50

  ** WATER LOOP
      TYPE                                           OPEN
      FRESH MAKE-UP WATER - LITER/S                     72.3         ( 1148 GPM)

  ** DISPOSAL
      TYPE                                           UNLINED POND


-------------------------------------------PERFORMANCE DATA----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  A           95.0
       B           94.6
       C           92.6
       D           93.5
       E           95.1
       F           94.3
       G           94.1
       H           93.8
       SYSTEM      94.1                                                    672   342

 3/79  A           96.1
       B           96.0
       C           93.2
       D           95.6
       E           96.5
       F           94.8
       G           95.7
       H           93.4
       SYSTEM      95.2                                                    744   314

 4/79  A           95.5
       B           95.7
       C           94.4
       D           91.4
       E           95.5
       F           96.2
```

KANSAS CITY POWER & LIGHT (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	G	95.9									
	H	95.7									
	SYSTEM	95.0						720	638		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79
NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR FEBRUARY OR MARCH.

START DATE 2/79 END DATE 3/79
THE UTILITY HAS REPORTED THAT MANY TUBE LEAKS AND CYCLONE LEAKS WERE EXPERIENCED WITH THE BOILER.

```
                                         SECTION 3
                      DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
----------------------------------------------------------------------------------------------------

COMPANY NAME                                          KANSAS POWER & LIGHT
PLANT NAME                                            JEFFREY
UNIT NUMBER                                           1
CITY                                                  WAMEGO
STATE                                                 KANSAS
GROSS UNIT GENERATING CAPACITY - MW                     720.0
NET UNIT GENERATING CAPACITY W/FGD - MW                 680.0
EQUIVALENT SCRUBBED CAPACITY - MW                       540.0

** FUEL DATA
    FUEL TYPE                                         COAL
    FUEL GRADE                                        ******
    AVERAGE HEAT CONTENT - KJ/KG                      18899.        (  8125 BTU/LB)
    AVERAGE ASH CONTENT - %                              5.80
    AVERAGE MOISTURE CONTENT - %                        30.00
    AVERAGE SULFUR CONTENT - %                            .32
    AVERAGE CHLORIDE CONTENT - %                          .01

** FGD SYSTEM
    GENERAL PROCESS TYPE                              WET SCRUBBING
    PROCESS TYPE                                      LIMESTONE
    SYSTEM SUPPLIER                                   COMBUSTION ENGINEERING
    NEW/RETROFIT                                      NEW
    ENERGY CONSUMPTION - %                            *******
    INITIAL START-UP DATE                              8/78
    COMMERCIAL START-UP DATE                           8/78
    SO2 DESIGN REMOVAL EFFICIENCY - %                    80.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %            99.00

** WATER LOOP
    TYPE                                              CLOSED
    FRESH MAKE-UP WATER - LITER/S                        35.1        (  557 GPM)

** TREATMENT
    TYPE                                              NON-PROPRIETARY

** DISPOSAL
    TYPE                                              UNLINED POND


---------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ -----  ------

 2/79  SYSTEM
                                                                           672

 3/79  SYSTEM
                                                                           744

 4/79  SYSTEM
                                                                           720     0      0      .0

 5/79  SYSTEM
                                                                           744     0      0      .0

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  5/79
                        THE BOILER WAS SHUT DOWN FOR WARRANTY INSPECTION ON APRIL 1 AND REMAINED
                        OUT OF SERVICE DURING MAY.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	LAWRENCE	
UNIT NUMBER	4	
CITY	LAWRENCE	
STATE	KANSAS	
GROSS UNIT GENERATING CAPACITY - MW	125.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	115.0	
EQUIVALENT SCRUBBED CAPACITY - MW	125.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	23260.	(10000 BTU/LB)
AVERAGE ASH CONTENT - %	9.80	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	.55	
AVERAGE CHLORIDE CONTENT - %	.03	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	1/76	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	73.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.90	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** TREATMENT		
TYPE	NONPROPRIETARY; FORCED OXIDATION WITH AIR	
** DISPOSAL		
TYPE	UNLINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
UNIT 4 EXPERIENCED A MOTOR FAILURE ON AN I.D. FAN DURING THE FEBRUARY-MARCH PERIOD.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

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-------------------------------------------------------------------------------------------------------

COMPANY NAME                                       KANSAS POWER & LIGHT
PLANT NAME                                         LAWRENCE
UNIT NUMBER                                        5
CITY                                               LAWRENCE
STATE                                              KANSAS
GROSS UNIT GENERATING CAPACITY - MW                  420.0
NET UNIT GENERATING CAPACITY W/FGD - MW              400.0
EQUIVALENT SCRUBBED CAPACITY - MW                    420.0

** FUEL DATA
    FUEL TYPE                                      COAL
    FUEL GRADE                                     ******
    AVERAGE HEAT CONTENT - KJ/KG                   23260.        ( 10000 BTU/LB)
    AVERAGE ASH CONTENT - %                            9.80
    AVERAGE MOISTURE CONTENT - %                   ********
    AVERAGE SULFUR CONTENT - %                          .55
    AVERAGE CHLORIDE CONTENT - %                        .03

** FGD SYSTEM
    GENERAL PROCESS TYPE                           WET SCRUBBING
    PROCESS TYPE                                   LIMESTONE
    SYSTEM SUPPLIER                                COMBUSTION ENGINEERING
    NEW/RETROFIT                                   RETROFIT
    ENERGY CONSUMPTION - %                         *******
    INITIAL START-UP DATE                          11/71
    COMMERCIAL START-UP DATE                       **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                52.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        98.90

** WATER LOOP
    TYPE                                           CLOSED
    FRESH MAKE-UP WATER - LITER/S                  *******         (***** GPM)

** TREATMENT
    TYPE                                           NONPROPRIETARY; FORCED OXIDATION WITH AIR

** DISPOSAL
    TYPE                                           UNLINED POND


------------------------------------------PERFORMANCE DATA---------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ---- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                              672

 3/79  SYSTEM                                                              744

 4/79  SYSTEM                                                              720

 5/79  SYSTEM                                                              744

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  5/79
                     THE UNIT WAS BROUGHT DOWN TO 1/2 CAPACITY FOR A SCHEDULED 3 WEEK
                     OUTAGE TO REBUILD AN AIR PREHEATER FAN MOTOR.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

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----------------------------------------------------------------------------------------------------------

 COMPANY NAME                                     KENTUCKY UTILITIES
 PLANT NAME                                       GREEN RIVER
 UNIT NUMBER                                      1-3
 CITY                                             CENTRAL CITY
 STATE                                            KENTUCKY
 GROSS UNIT GENERATING CAPACITY - MW                 64.0
 NET UNIT GENERATING CAPACITY W/FGD - MW             60.0
 EQUIVALENT SCRUBBED CAPACITY - MW                   64.0

 ** FUEL DATA
     FUEL TYPE                                    COAL
     FUEL GRADE                                   BITUMINOUS
     AVERAGE HEAT CONTENT - KJ/KG                 25586.        ( 11000 BTU/LB)
     AVERAGE ASH CONTENT - %                         13.40
     AVERAGE MOISTURE CONTENT - %                    12.10
     AVERAGE SULFUR CONTENT - %                       4.00
     AVERAGE CHLORIDE CONTENT - %                 ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                         WET SCRUBBING
     PROCESS TYPE                                 LIME
     SYSTEM SUPPLIER                              AMERICAN AIR FILTER
     NEW/RETROFIT                                 RETROFIT
     ENERGY CONSUMPTION - %                         3.1
     INITIAL START-UP DATE                         9/75
     COMMERCIAL START-UP DATE                      6/76
     SO2 DESIGN REMOVAL EFFICIENCY - %               80.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.50

 ** WATER LOOP
     TYPE                                         CLOSED
     FRESH MAKE-UP WATER - LITER/S                   4.7        (    75 GPM)

 ** DISPOSAL
     TYPE                                         LINED POND


-------------------------------------------PERFORMANCE DATA-----------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM       .0                      .0          .0                   672     0      0     .0

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  1/79        END DATE  2/79
                        THE PROBLEMS IN JANUARY AND FEBRUARY WERE A RESULT OF FREEZING WEATHER.

 3/79  SYSTEM     11.2        100.0       100.0        11.2                  744    83     83

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  3/79        END DATE  4/79
                        THE LOW OPERATIONAL HOURS FOR MARCH AND APRIL DUE TO RECYCLE PUMP PROB-
                        LEMS.

 4/79             18.2        100.0       100.0        18.2
       SYSTEM                                                                720   131

 5/79               .0                      .0          .0
       SYSTEM                                                                744     0            .0

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  5/79        END DATE  5/79
                        THE BOILER WAS TAKEN DOWN IN MAY FOR REPAIRS THAT IS PROJECTED TO LAST
                        THROUGH THE END OF SEPTEMBER.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	4	
CITY	LOUISVILLE	
STATE	KENTUCKY	
GROSS UNIT GENERATING CAPACITY - MW	188.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	175.0	
EQUIVALENT SCRUBBED CAPACITY - MW	188.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	26749.	(11500 BTU/LB)
AVERAGE ASH CONTENT - %	17.10	
AVERAGE MOISTURE CONTENT - %	9.00	
AVERAGE SULFUR CONTENT - %	3.75	
AVERAGE CHLORIDE CONTENT - %	.04	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	AMERICAN AIR FILTER	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	1.6	
INITIAL START-UP DATE	8/76	
COMMERCIAL START-UP DATE	9/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	6.3	(100 GPM)
** DISPOSAL		
TYPE	LINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	100.0						672	0		
3/79	SYSTEM	100.0						744	0		
4/79	SYSTEM	100.0						720	0		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79

THE UNIT DID NOT OPERATE DURING THESE MONTHS BECAUSE THE BOILER WAS STILL DOWN WITH TUBE LEAKS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC
PLANT NAME	CANE RUN
UNIT NUMBER	5
CITY	LOUISVILLE
STATE	KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW	190.0
NET UNIT GENERATING CAPACITY W/FGD - MW	180.0
EQUIVALENT SCRUBBED CAPACITY - MW	190.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - KJ/KG	26749. (11500 BTU/LB)
AVERAGE ASH CONTENT - %	17.10
AVERAGE MOISTURE CONTENT - %	9.00
AVERAGE SULFUR CONTENT - %	3.75
AVERAGE CHLORIDE CONTENT - %	.04
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	1.6
INITIAL START-UP DATE	12/77
COMMERCIAL START-UP DATE	5/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00
** WATER LOOP	
TYPE	OPEN
FRESH MAKE-UP WATER - LITER/S	******* (***** GPM)
** DISPOSAL	
TYPE	LINED POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	70.6			50.1			672	477	337	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79
DURING FEBRUARY FREEZING CAUSED PROBLEMS WITH LIME DELIVERY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM		71.8		57.5			744	596	428	
4/79	SYSTEM		99.2		49.6			720	360	357	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
SOME PROBLEMS WERE EXPERIENCED WITH DAMPERS AND THERE WERE PUMP FAILURES.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

```
COMPANY NAME                                  LOUISVILLE GAS & ELECTRIC
PLANT NAME                                    CANE RUN
UNIT NUMBER                                   6
CITY                                          LOUISVILLE
STATE                                         KENTUCKY
REGULATORY CLASSIFICATION                     A
PARTICULATE EMISSION LIMITATION - NG/J          50.           (  .116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  516.          ( 1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              992.0
GROSS UNIT GENERATING CAPACITY - MW             288.0
NET UNIT GENERATING CAPACITY W/FGD - MW         269.0
NET UNIT GENERATING CAPACITY WO/FGD - MW        272.0
EQUIVALENT SCRUBBED CAPACITY - MW               288.0

** BOILER DATA
    SUPPLIER                                  COMBUSTION ENGINEERING
    TYPE                                      PULVERIZED COAL
    SERVICE LOAD                              BASE
    COMMERCIAL SERVICE DATE                    0/69
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       459.63        ( 974000 ACFM)
    FLUE GAS TEMPERATURE - C                    148.9         ( 300 F)
    STACK HEIGHT - M                          ******          (**** FT)
    STACK TOP DIAMETER - M                    *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                BITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG               26749.         ( 11500 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                10.400-11,900
    AVERAGE ASH CONTENT - %                        17.10
    RANGE ASH CONTENT - %                     15.5-24.5
    AVERAGE MOISTURE CONTENT - %                    9.00
    RANGE MOISTURE CONTENT - %                8.0-10.75
    AVERAGE SULFUR CONTENT - %                      3.75
    RANGE SULFUR CONTENT - %                  3.5-4.0
    AVERAGE CHLORIDE CONTENT - %                     .04
    RANGE CHLORIDE CONTENT - %                0.03-0.06
    FUEL FIRING RATE - M T/H                  *******         (*** TPH)
    FUEL FIRING RATE - MW                     *****

** ESP
    NUMBER                                     1

** FGD SYSTEM
    SALEABLE PRODUCT/THROWAWAY PRODUCT        THROWAWAY PRODUCT
    GENERAL PROCESS TYPE                      WET SCRUBBING
    PROCESS TYPE                              DUAL ALKALI
    SYSTEM SUPPLIER                           ADL/COMBUSTION EQUIP ASSOCIATE
    DEVELOPMENT LEVEL                         FULL-SCALE DEMONSTRATION
    NEW/RETROFIT                              RETROFIT
    SO2 DESIGN REMOVAL EFFICIENCY - %             95.00
    INITIAL START-UP                            3/79
    CONTRACT AWARDED                          10/76

** ABSORBER
    NUMBER                                     2
    TYPE                                      TRAY TOWER
    INITIAL START UP                          12/78
    SUPPLIER                                  COMBUSTION EQUIPMENT ASSOCIATES
    NUMBER OF STAGES                               2
    BOILER LOAD/ABSORBER - %                      60.0
    GAS TEMPERATURE - C                           80.0        (  176 F)
    L/G RATIO - L/CU.M                             1.3        ( 10.0 GAL/1000ACF)
    SUPERFICAL GAS VELOCITY - M/SEC                2.7        (  9.0 FT/S)
    SO2 INLET CONCENTRATION - PPM              3471
    SO2 OUTLET CONTRATION _ PPM                 200

** FANS
    NUMBER                                     2
    TYPE                                      BOOSTER
```

```
 ** VACUUM FILTER
      NUMBER                                      3
      TYPE                                       ROTARY-DRUM WITH WATER WASH

 ** PUMPS
      SERVICE                                    NUMBER
      -------                                    ------
      REACTOR PUMP                                 2

 ** TANKS
      SERVICE                                    NUMBER
      -------                                    ------
      PRIMARY REACTION TANK                        2
      SECONDARY REACTION TANK                      2
      FEED FORWARD TANK                          ****
      FILTRATE SUMP                              ****

 ** THICKENER
      NUMBER                                      1
      CONSTRUCTION MATERIAL                      CONCRETE
      DIAMETER - M                                 38.1          (125 FT)
      OUTLET SOLIDS - %                            25.0

 ** WATER LOOP
      TYPE                                       OPEN

 ** DISPOSAL
      NATURE                                     FINAL
      TYPE                                       LINED POND
      LOCATION                                   ON SITE


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD    CAP.
                                                                SO2  PART. HOURS HOURS  HOURS  FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ -----  ------

 4/79  SYSTEM                  43.3                    37.9                  62    475    237

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  4/79        END DATE  4/79
                        THIS UNIT STARTED OPERATING ON APRIL 4, 1979.  COMPLIANCE TESTING IS
                        SCHEDULED FOR THE WEEK OF JUNE 3.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC
PLANT NAME	MILL CREEK
UNIT NUMBER	3
CITY	LOUISVILLE
STATE	KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW	442.0
NET UNIT GENERATING CAPACITY W/FGD - MW	420.0
EQUIVALENT SCRUBBED CAPACITY - MW	442.0

** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	26749.	(11500 BTU/LB)
AVERAGE ASH CONTENT - %	11.50	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	3.75	
AVERAGE CHLORIDE CONTENT - %	********	

** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	AMERICAN AIR FILTER
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	1.6
INITIAL START-UP DATE	8/78
COMMERCIAL START-UP DATE	3/79
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00

** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	9.4	(150 GPM)

** TREATMENT	
TYPE	FLYASH AND LIME STABILIZED

** DISPOSAL	
TYPE	SLUDGE POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM		18.0		17.4			672	651	117	
3/79	SYSTEM		53.1		52.4			744	735	390	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
COMPLIANCE TESTING WAS PERFORMED DURING MARCH AND THE UNIT WAS DECLARED COMMERCIAL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM		63.6		44.4			720	503	320	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
THE ONLY PROBLEMS REPORTED WERE DAMPERS AND PUMP FAILURES.

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EPA UTILITY FGD SURVEY: FEBRUARY - MARCH 1979

                                   SECTION 3
                   DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
---------------------------------------------------------------------------------------------

 COMPANY NAME                                    LOUISVILLE GAS & ELECTRIC
 PLANT NAME                                      PADDY'S RUN
 UNIT NUMBER                                     6
 CITY                                            LOUISVILLE
 STATE                                           KENTUCKY
 GROSS UNIT GENERATING CAPACITY - MW                72.0
 NET UNIT GENERATING CAPACITY W/FGD - MW            67.0
 EQUIVALENT SCRUBBED CAPACITY - MW                  72.0

 ** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   ******
    AVERAGE HEAT CONTENT - KJ/KG                 26749.        ( 11500 BTU/LB)
    AVERAGE ASH CONTENT - %                         11.50
    AVERAGE MOISTURE CONTENT - %                 ********
    AVERAGE SULFUR CONTENT - %                       2.50
    AVERAGE CHLORIDE CONTENT - %                 ********

 ** FGD SYSTEM
    GENERAL PROCESS TYPE                         WET SCRUBBING
    PROCESS TYPE                                 LIME
    SYSTEM SUPPLIER                              COMBUSTION ENGINEERING
    NEW/RETROFIT                                 RETROFIT
    ENERGY CONSUMPTION - %                           2.8
    INITIAL START-UP DATE                         4/73
    COMMERCIAL START-UP DATE                     **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %               90.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.10

 ** WATER LOOP
    TYPE                                         CLOSED
    FRESH MAKE-UP WATER - LITER/S                    3.1        (   50 GPM)

 ** TREATMENT
    TYPE                                         FIXATION WITH LIME

 ** DISPOSAL
    TYPE                                         UNLINED POND


-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2 PART. HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM     100.0                                                    672      0      0     .0

 3/79  SYSTEM     100.0                                                    744      0      0     .0

 4/79  SYSTEM     100.0                                                    720      0      0     .0

        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  4/79
                    THE UNIT WAS NOT OPERATED DURING THESE MONTHS BECAUSE OF LACK OF DEMAND.
```

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                                  SECTION 3
             DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
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COMPANY NAME                                       MINNKOTA POWER COOPERATIVE
PLANT NAME                                         MILTON R. YOUNG
UNIT NUMBER                                        2
CITY                                               CENTER
STATE                                              NORTH DAKOTA
GROSS UNIT GENERATING CAPACITY - MW                  477.0
NET UNIT GENERATING CAPACITY W/FGD - MW              408.0
EQUIVALENT SCRUBBED CAPACITY - MW                    405.0

** FUEL DATA
    FUEL TYPE                                      COAL
    FUEL GRADE                                     LIGNITE
    AVERAGE HEAT CONTENT - KJ/KG                   15119.        (  6500 BTU/LB)
    AVERAGE ASH CONTENT - %                        ********
    AVERAGE MOISTURE CONTENT - %                      38.00
    AVERAGE SULFUR CONTENT - %                          .70
    AVERAGE CHLORIDE CONTENT - %                   ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                           WET SCRUBBING
    PROCESS TYPE                                   LIME/ALKALINE FLYASH
    SYSTEM SUPPLIER                                ADL/COMBUSTION EQUIP ASSOCIATE
    NEW/RETROFIT                                   NEW
    ENERGY CONSUMPTION - %                             1.9
    INITIAL START-UP DATE                           9/77
    COMMERCIAL START-UP DATE                        6/78
    SO2 DESIGN REMOVAL EFFICIENCY - %                85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %        99.60

** WATER LOOP
    TYPE                                           OPEN
    FRESH MAKE-UP WATER - LITER/S                     44.1        (  700 GPM)

** DISPOSAL
    TYPE                                           MINEFILL


--------------------------------------PERFORMANCE DATA-------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                              672

 3/79  SYSTEM                                                              744

       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  2/79        END DATE  3/79
                         NO INFORMATION WAS REPORTED BY THE UTILITY FOR THIS REPORT PERIOD.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	MONTANA POWER	
PLANT NAME	COLSTRIP	
UNIT NUMBER	1	
CITY	COLSTRIP	
STATE	MONTANA	
GROSS UNIT GENERATING CAPACITY - MW	360.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	332.0	
EQUIVALENT SCRUBBED CAPACITY - MW	360.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	20569.	(8843 BTU/LB)
AVERAGE ASH CONTENT - %	8.60	
AVERAGE MOISTURE CONTENT - %	23.90	
AVERAGE SULFUR CONTENT - %	.77	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIME	
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	3.3	
INITIAL START-UP DATE	9/75	
COMMERCIAL START-UP DATE	11/75	
SO2 DESIGN REMOVAL EFFICIENCY - %	60.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** DISPOSAL		
TYPE	SLUDGE POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	SYSTEM	96.7						744			
1/79	SYSTEM	97.6						744			
2/79	SYSTEM	90.3						672			

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	MONTANA POWER
PLANT NAME	COLSTRIP
UNIT NUMBER	2
CITY	COLSTRIP
STATE	MONTANA
GROSS UNIT GENERATING CAPACITY - MW	360.0
NET UNIT GENERATING CAPACITY W/FGD - MW	332.0
EQUIVALENT SCRUBBED CAPACITY - MW	360.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - KJ/KG	20569. (8843 BTU/LB)
AVERAGE ASH CONTENT - %	8.60
AVERAGE MOISTURE CONTENT - %	23.90
AVERAGE SULFUR CONTENT - %	.77
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE
NEW/RETROFIT	NEW
ENERGY CONSUMPTION - %	3.3
INITIAL START-UP DATE	5/76
COMMERCIAL START-UP DATE	10/76
SO2 DESIGN REMOVAL EFFICIENCY - %	60.00
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	90.50
** WATER LOOP	
TYPE	CLOSED
FRESH MAKE-UP WATER - LITER/S	******* (***** GPM)
** DISPOSAL	
TYPE	SLUDGE POND

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/78	SYSTEM	91.2						744			
1/79	SYSTEM	94.3						744			
2/79	SYSTEM	98.3						672			

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	1	
CITY	MOAPA	
STATE	NEVADA	
GROSS UNIT GENERATING CAPACITY - MW	125.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	110.0	
EQUIVALENT SCRUBBED CAPACITY - MW	125.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	28950.	(12450 BTU/LB)
AVERAGE ASH CONTENT - %	8.00	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	.50	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	SODIUM CARBONATE	
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	4/74	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.00	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	1.6	(25 GPM)
** DISPOSAL		
TYPE	EVAP POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM	97.9	96.5	96.5	78.3			744	603	582	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
THE FGD SYSTEM WAS OFF TO UNPLUG VENTURI NOZZLES AND TO CLEAN SENSING LINES. THE DOWNTIME WAS ABOUT 15 HOURS.

START DATE 3/79 END DATE 3/79
THE FGD SYSTEM WAS OFF FOR ABOUT 146 HOURS FOR REPAIR OF BOILER TUBE LEAKS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM	100.0	98.7	98.6	25.7			720	188	185	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 4/79
THE BOILER AND FGD SYSTEM WERE OFF FOR APPROXIMATELY 533 HOURS FOR SCHEDULED MAINTENANCE.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	2	
CITY	MOAPA	
STATE	NEVADA	
GROSS UNIT GENERATING CAPACITY - MW	125.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	110.0	
EQUIVALENT SCRUBBED CAPACITY - MW	125.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	28842.	(12400 BTU/LB)
AVERAGE ASH CONTENT - %	8.00	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	.50	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	SODIUM CARBONATE	
SYSTEM SUPPLIER	ADL/COMBUSTION EQUIP ASSOCIATE	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	4/74	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	97.00	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	1.6	(25 GPM)
** DISPOSAL		
TYPE	EVAP POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM	88.8	95.9	96.0	88.8			744	688	640	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
THE BOILER AND SCRUBBER WERE OFF FOR ABOUT TWO DAYS FOR REPAIR OF BOILER TUBE LEAKS.

START DATE 3/79 END DATE 3/79
THE BOILER TRIPPED DUE TO HIGH FURNACE PRESSURE. WHILE THE BOILER WAS DOWN SENSING LINES WERE CLEANED ON THE SCRUBBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	SYSTEM							720	666		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/78 END DATE 4/78
A HIGH PRESSURE ALARM ON THE SCRUBBER DUCT TRIPPED THE SCRUBBER OFF LINE. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED. THIS OCCURRED TWICE DURING THE MONTH OF APRIL.

START DATE 4/78 END DATE 4/78
A CONTROL POWER FAILURE OCCURRED CAUSING A SCRUBBER TRIP WHEN THE 10 KW GENERATOR WAS PUT BACK IN SERVICE.

```
                                        SECTION 3
                      DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
----------------------------------------------------------------------------------------------------

 COMPANY NAME                                         NEVADA POWER
 PLANT NAME                                           REID GARDNER
 UNIT NUMBER                                          3
 CITY                                                 MOAPA
 STATE                                                NEVADA
 GROSS UNIT GENERATING CAPACITY - MW                     125.0
 NET UNIT GENERATING CAPACITY W/FGD - MW                 110.0
 EQUIVALENT SCRUBBED CAPACITY - MW                       125.0

 ** FUEL DATA
     FUEL TYPE                                        COAL
     FUEL GRADE                                       ******
     AVERAGE HEAT CONTENT - KJ/KG                     28959.         ( 12450 BTU/LB)
     AVERAGE ASH CONTENT - %                              8.00
     AVERAGE MOISTURE CONTENT - %                     ********
     AVERAGE SULFUR CONTENT - %                            .50
     AVERAGE CHLORIDE CONTENT - %                     ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                             WET SCRUBBING
     PROCESS TYPE                                     SODIUM CARBONATE
     SYSTEM SUPPLIER                                  ADL/COMBUSTION EQUIP ASSOCIATE
     NEW/RETROFIT                                     NEW
     ENERGY CONSUMPTION - %                           *******
     INITIAL START-UP DATE                             6/76
     COMMERCIAL START-UP DATE                          7/76
     SO2 DESIGN REMOVAL EFFICIENCY - %                   85.00
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %           99.00

 ** WATER LOOP
     TYPE                                             OPEN
     FRESH MAKE-UP WATER - LITER/S                        1.6        (   25 GPM)

 ** DISPOSAL
     TYPE                                             EVAP POND


-------------------------------------------PERFORMANCE DATA-----------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 3/79  SYSTEM     100.0         97.9       100.0        67.7                 744   246    241

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  3/79         END DATE  3/79
                       THE BOILER AND FGD SYSTEM WERE OFF FOR ABOUT 2 DAYS TO REPAIR AND BALANCE
                       A BOILER I.D. FAN.

           START DATE  3/79         END DATE  3/79
                       THE BOILER AND FGD SYSTEM WERE OFF FOR ABOUT 19 DAY FOR SCHEDULED MAIN-
                       TENANCE.

 4/79  SYSTEM     100.0        100.0       100.0       100.0                 720   719    719

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  4/79         END DATE  4/79
                       NO OUTAGES WERE REPORTED FOR APRIL.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NORTHERN INDIANA PUB SERVICE	
PLANT NAME	DEAN H. MITCHELL	
UNIT NUMBER	11	
CITY	GARY	
STATE	INDIANA	
GROSS UNIT GENERATING CAPACITY - MW	115.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	115.0	
EQUIVALENT SCRUBBED CAPACITY - MW	115.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	25586.	(11000 BTU/LB)
AVERAGE ASH CONTENT - %	********	
AVERAGE MOISTURE CONTENT - %	11.00	
AVERAGE SULFUR CONTENT - %	3.50	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY POWERGAS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	7/76	
COMMERCIAL START-UP DATE	6/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	98.50	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** BYPRODUCT		
BYPRODUCT NATURE	ELEMENTAL SULFUR	
DISPOSITION		

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM	7.0		1.0	1.0			720		5	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79
THE BOILER OPERATED ON LOW SULFUR COAL FEBRUARY 1-12 AND HIGH SULFUR COAL FEBRUARY 13-MARCH 2. THE FGD SYSTEM REMAINED DOWN THROUGH FEBRUARY 22 FOR COMPLETION OF SULFUR CONDENSER REPAIRS FOLLOWED BY REPAIR OF EXPANSION JOINT LEAKS.

START DATE 2/79 END DATE 2/79
A POWER INTERUPTION ON FEBRUARY 24 RESULTED IN LOSS OF SEAL WATER TO THE EVAPORATOR PUMP AND PACKING FAILURE. THE FGD SYSTEM REMAINED DOWN THROUGH MARCH 2.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	SYSTEM	47.0		44.0	43.0			720		308	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
THE BOILER OPERATED ON HIGH SULFUR COAL.

START DATE 3/79 END DATE 3/79
THE FGD SYSTEM WAS SHUT DOWN DUE TO HIGH LEAKAGE IN THE EVAPORATOR CIRCULATING PUMP PACKING GLAND. THE PUMP SHAFT SLEEVE WAS REPLACED AND THE PUMP REALIGNED. THE SYSTEM WAS DOWN FOR ABOUT 16 DAYS.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE	
UNIT NUMBER	1	
CITY	BECKER	
STATE	MINNESOTA	
GROSS UNIT GENERATING CAPACITY - MW	740.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	700.0	
EQUIVALENT SCRUBBED CAPACITY - MW	740.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	19771.	(8500 BTU/LB)
AVERAGE ASH CONTENT - %	9.00	
AVERAGE MOISTURE CONTENT - %	25.00	
AVERAGE SULFUR CONTENT - %	.80	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	2.7	
INITIAL START-UP DATE	3/76	
COMMERCIAL START-UP DATE	5/76	
SO2 DESIGN REMOVAL EFFICIENCY - %	50.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** TREATMENT		
TYPE	FORCIBLY OXIDIZED	
** DISPOSAL		
TYPE	LINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	101		78.0		78.0						
	102		73.0		73.0						
	103		70.0		70.0						
	104		76.0		76.0						
	105		50.0		50.0						
	106		91.0		91.0						
	107		92.0		92.0						
	108		92.0		92.0						
	109		75.0		75.0						
	110		77.0		77.0						
	111		66.0		66.0						
	112		93.0		93.0						
	SYSTEM	89.0						672	672		67.9
3/79	101		61.0		60.1						
	102		88.0		86.8						
	103		45.0		44.4						
	104		86.0		84.8						
	105		94.0		92.7						
	106		71.0		70.0						
	107		91.0		89.8						
	108		73.0		72.0						
	109		91.0		89.8						

NORTHERN STATES POWER (CONT.)

PERFORMANCE DATA												
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	110		80.0		75.9						
	111		89.0		87.8						
	112		80.0		78.9						
	SYSTEM	92.0									
								744	734		59.4

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79
THE ONLY MOJOR PROBLEM REPORTED BY THE UTILITY WAS BOILER RELATED - SPECIFICALLY PROBLEMS WITH WET COAL.

START DATE 3/79 END DATE 3/79
CURRENTLY THE UTILITY IS INCREASING THE RECYCLE PUMP CAPACITY BY INSTALLING 800 GPM WORTHINGTON RECYCLE PUMPS. DURING THIS PERIOD THEY HAVE BEEN INSTALLED ON MODULES 101,103,104,105,107, AND 110.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE	
UNIT NUMBER	2	
CITY	BECKER	
STATE	MINNESOTA	
GROSS UNIT GENERATING CAPACITY - MW	740.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	700.0	
EQUIVALENT SCRUBBED CAPACITY - MW	740.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	19771.	(8500 BTU/LB)
AVERAGE ASH CONTENT - %	9.00	
AVERAGE MOISTURE CONTENT - %	25.00	
AVERAGE SULFUR CONTENT - %	.80	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	2.7	
INITIAL START-UP DATE	4/77	
COMMERCIAL START-UP DATE	4/77	
SO_2 DESIGN REMOVAL EFFICIENCY - %	50.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** TREATMENT		
TYPE	FORCIBLY OXIDIZED	
** DISPOSAL		
TYPE	LINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	201		86.0								
	202		84.0								
	204		89.0								
	205		59.0								
	206		76.0								
	207		72.0								
	208		65.0								
	209		80.0								
	210		75.0								
	211		92.0								
	212		65.0								
	SYSTEM	93.0						672	671		
3/79	201		85.0								
	202		69.0								
	203		78.0								
	204		47.0								
	205		71.0								
	206		76.0								
	207		90.0								
	208		78.0								
	209		50.0								
	210		85.0								

NORTHERN STATES POWER (CONT.)

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	211		57.0								
	212		86.0								
	SYSTEM	91.0						744	744		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79

THE ONLY REAL PROBLEMS ENCOUNTERED DURING THIS PERIOD WERE PROBLEMS WITH WET COAL.

START DATE 2/79 END DATE 3/79

THE RECYCLE PUMPS ARE BEING REPLACED WITH LARGER 8000 GPM WORTHINGTON PUMPS. DURING THIS PERIOD THE PUMPS WERE INSTALLED ON MODULES 204 AND 206.

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                                          SECTION 3
                      DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------------

 COMPANY NAME                                       PENNSYLVANIA POWER
 PLANT NAME                                         BRUCE MANSFIELD
 UNIT NUMBER                                        1
 CITY                                               SHIPPINGPORT
 STATE                                              PENNSYLVANIA
 GROSS UNIT GENERATING CAPACITY - MW                  917.0
 NET UNIT GENERATING CAPACITY W/FGD - MW              825.0
 EQUIVALENT SCRUBBED CAPACITY - MW                    917.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     BITUMINOUS
     AVERAGE HEAT CONTENT - KJ/KG                   26749.          ( 11500 BTU/LB)
     AVERAGE ASH CONTENT - %                           12.90
     AVERAGE MOISTURE CONTENT - %                       7.00
     AVERAGE SULFUR CONTENT - %                         3.00
     AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIME
     SYSTEM SUPPLIER                                CHEMICO
     NEW/RETROFIT                                   NEW
     ENERGY CONSUMPTION - %                             6.0
     INITIAL START-UP DATE                          12/75
     COMMERCIAL START-UP DATE                        6/76
     SO2 DESIGN REMOVAL EFFICIENCY - %                 92.10
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.80

 ** WATER LOOP
     TYPE                                           OPEN
     FRESH MAKE-UP WATER - LITER/S                  *******         (***** GPM)

 ** TREATMENT
     TYPE                                           CALCILOX

 ** DISPOSAL
     TYPE                                           LANDFILL


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL    PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                 672

 3/79  SYSTEM                                                                 744

 4/79  SYSTEM                                                                 720

 5/79  SYSTEM                                                                 744

      ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  2/79         END DATE  5/79
                       UNIT 1 IS CURRENTLY DOWN FOR BOILER OUTAGE.

           START DATE  2/79         END DATE  5/79
                       SIX OF THE TWELVE FAN HOUSINGS HAVE BEEN CHANGED FROM CARBON STEEL TO
                       INCOLLOY 825.
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                                   SECTION 3
                  DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-----------------------------------------------------------------------------------------

COMPANY NAME                                       PENNSYLVANIA POWER
PLANT NAME                                         BRUCE MANSFIELD
UNIT NUMBER                                        2
CITY                                               SHIPPINGPORT
STATE                                              PENNSYLVANIA
GROSS UNIT GENERATING CAPACITY - MW                  917.0
NET UNIT GENERATING CAPACITY W/FGD - MW              825.0
EQUIVALENT SCRUBBED CAPACITY - MW                    917.0

** FUEL DATA
   FUEL TYPE                                       COAL
   FUEL GRADE                                      BITUMINOUS
   AVERAGE HEAT CONTENT - KJ/KG                    26749.         ( 11500 BTU/LB)
   AVERAGE ASH CONTENT - %                            12.90
   AVERAGE MOISTURE CONTENT - %                        7.00
   AVERAGE SULFUR CONTENT - %                          3.00
   AVERAGE CHLORIDE CONTENT - %                    ********

** FGD SYSTEM
   GENERAL PROCESS TYPE                            WET SCRUBBING
   PROCESS TYPE                                    LIME
   SYSTEM SUPPLIER                                 CHEMICO
   NEW/RETROFIT                                    NEW
   ENERGY CONSUMPTION - %                              6.0
   INITIAL START-UP DATE                            7/77
   COMMERCIAL START-UP DATE                        10/77
   SO2 DESIGN REMOVAL EFFICIENCY - %                  92.10
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %          99.80

** WATER LOOP
   TYPE                                            OPEN
   FRESH MAKE-UP WATER - LITER/S                   *******        (***** GPM)

** TREATMENT
   TYPE                                            CALCILOX

** DISPOSAL
   TYPE                                            LANDFILL


------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ---- ----- ----- ------ ----- ------

 2/79  SYSTEM
                                                                            672
 3/79  SYSTEM
                                                                            744
 4/79  SYSTEM
                                                                            720
       ** PROBLEMS/SOLUTIONS/COMMENTS

             START DATE  1/79        END DATE  4/79
                   NO INFORMATION WAS REPORTED FOR THIS PERIOD BY THE UTILITY.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	PHILADELPHIA ELECTRIC	
PLANT NAME	EDDYSTONE	
UNIT NUMBER	1A	
CITY	EDDYSTONE	
STATE	PENNSYLVANIA	
GROSS UNIT GENERATING CAPACITY - MW	120.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	120.0	
EQUIVALENT SCRUBBED CAPACITY - MW	120.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	31634.	(13600 BTU/LB)
AVERAGE ASH CONTENT - %	9.40	
AVERAGE MOISTURE CONTENT - %	5.90	
AVERAGE SULFUR CONTENT - %	2.60	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	MAGNESIUM OXIDE	
SYSTEM SUPPLIER	UNITED ENGINEERS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	9/75	
COMMERCIAL START-UP DATE	9/75	
SO2 DESIGN REMOVAL EFFICIENCY - %	90.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.00	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	8.3	(132 GPM)
** BYPRODUCT		
BYPRODUCT NATURE	SULFURIC ACID	
DISPOSITION		

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79
NO INFORMATION WAS REPORTED FOR THIS REPORT PERIOD.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	PUBLIC SERVICE OF NEW MEXICO	
PLANT NAME	SAN JUAN	
UNIT NUMBER	1	
CITY	WATERFLOW	
STATE	NEW MEXICO	
GROSS UNIT GENERATING CAPACITY - MW	361.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	314.0	
EQUIVALENT SCRUBBED CAPACITY - MW	361.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	18841.	(8100 BTU/LB)
AVERAGE ASH CONTENT - %	22.45	
AVERAGE MOISTURE CONTENT - %	14.82	
AVERAGE SULFUR CONTENT - %	.80	
AVERAGE CHLORIDE CONTENT - %	*********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	WELLMAN LORD	
SYSTEM SUPPLIER	DAVY POWERGAS	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	4.4	
INITIAL START-UP DATE	4/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	30.2	(480 GPM)
** BYPRODUCT		
BYPRODUCT NATURE	ELEMENTAL SULFUR	
DISPOSITION	MARKETED	

---PERFORMANCE DATA---

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			
5/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 1/79 END DATE 5/79
HOURS ARE NOT YET AVAILABLE BECAUSE THE UTILITY IS CONCENTRATING EFFORTS ON OPERATION OF THIS NEW UNIT. THE UTILITY REPORTED THAT THE SCRUBBING MODULES THEMSELVES ARE OPERATING FINE. ALSO THE CHEMICAL PLANT IS READY AND THERE IS NO SYSTEM PLUGGING WHATSOEVER.

START DATE 1/79 END DATE 5/79
THE MAJOR PROBLEM ENCOUNTERED WAS GYRATING FANS.

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EPA UTILITY FGD SURVEY: FEBRUARY - MARCH 1979

                                    SECTION 3
                 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
-------------------------------------------------------------------------------------------------

COMPANY NAME                                          PUBLIC SERVICE OF NEW MEXICO
PLANT NAME                                            SAN JUAN
UNIT NUMBER                                           2
CITY                                                  WATERFLOW
STATE                                                 NEW MEXICO
GROSS UNIT GENERATING CAPACITY - MW                     350.0
NET UNIT GENERATING CAPACITY W/FGD - MW                 306.0
EQUIVALENT SCRUBBED CAPACITY - MW                       350.0

** FUEL DATA
    FUEL TYPE                                         COAL
    FUEL GRADE                                        ******
    AVERAGE HEAT CONTENT - KJ/KG                      20934.          (  9000 BTU/LB)
    AVERAGE ASH CONTENT - %                             22.45
    AVERAGE MOISTURE CONTENT - %                        14.82
    AVERAGE SULFUR CONTENT - %                            .80
    AVERAGE CHLORIDE CONTENT - %                      ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                              WET SCRUBBING
    PROCESS TYPE                                      WELLMAN LORD
    SYSTEM SUPPLIER                                   DAVY POWERGAS
    NEW/RETROFIT                                      RETROFIT
    ENERGY CONSUMPTION - %                                4.6
    INITIAL START-UP DATE                              8/78
    COMMERCIAL START-UP DATE                          **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                    85.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %            99.50

** WATER LOOP
    TYPE                                              CLOSED
    FRESH MAKE-UP WATER - LITER/S                     *******         (***** GPM)

** BYPRODUCT
    BYPRODUCT NATURE                                  ELEMENTAL SULFUR
    DISPOSITION                                       MARKETED

------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ---- ----- ----- ------ ----- ------

                                                                            672
 2/79  SYSTEM
                                                                            744
 3/79  SYSTEM
                                                                            720
 4/79  SYSTEM
                                                                            720
 5/79  SYSTEM

      ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE   1/79        END DATE   5/79
              HOURS ARE NOT YET AVAILABLE BECAUSE THE UTILITY IS CONCENTRATING EFFORTS
              ON OPERATION OF THIS NEW UNIT.  THE UTILITY REPORTED THAT THE SCRUBBING
              MODULES THEMSELVES ARE OPERATING FINE.  ALSO THE CHEMICAL PLANT IS READY
              AND THERE IS NO SYSTEM PLUGGING WHATSOEVER.

              START DATE   1/79        END DATE   5/79
              THE MAJOR PROBLEM ENCOUNTERED WAS GYRATING FANS.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	SOUTH CAROLINA PUBLIC SERVICE	
PLANT NAME	WINYAH	
UNIT NUMBER	2	
CITY	GEORGETOWN	
STATE	SOUTH CAROLINA	
GROSS UNIT GENERATING CAPACITY - MW	280.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	258.0	
EQUIVALENT SCRUBBED CAPACITY - MW	140.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	26749.	(11500 BTU/LB)
AVERAGE ASH CONTENT - %	13.50	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	1.00	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	BABCOCK & WILCOX	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	.7	
INITIAL START-UP DATE	7/77	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	69.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40	
** WATER LOOP		
TYPE	OPEN	
FRESH MAKE-UP WATER - LITER/S	6.3	(100 GPM)
** DISPOSAL		
TYPE	UNLINED POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM	96.6	96.4	96.4	92.7			744	1361	1313	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79
AN OUTAGE WAS REQUIRED TO RENEW QUENCHER PUMP BELTS AND FOR REPAIRS TO QUENCHER SUCTION VALVE.

START DATE 2/79 END DATE 3/79
OUTAGES WERE REQUIRED TO REPAIR A HOLE IN THE FEED SLURRY LINE, TO INSPECT THE MODULE FOR PLUGGAGE, AND BECAUSE OF A BOOSTER FAN TRIP.

START DATE 2/79 END DATE 3/79
THE OPERATING VALUES SHOWN ARE THE FIGURES OF FEBRUARY AND MARCH COMBINED.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

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COMPANY NAME                                      SOUTHERN INDIANA GAS & ELEC
PLANT NAME                                        A.B. BROWN
UNIT NUMBER                                       1
CITY                                              WEST FRANKLIN
STATE                                             INDIANA
REGULATORY CLASSIFICATION                         A
PARTICULATE EMISSION LIMITATION - NG/J              43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                      516.         ( 1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  250.0
GROSS UNIT GENERATING CAPACITY - MW                 265.0
NET UNIT GENERATING CAPACITY W/FGD - MW             250.0
NET UNIT GENERATING CAPACITY WO/FGD - MW            255.0
EQUIVALENT SCRUBBED CAPACITY - MW                   265.0

** BOILER DATA
    SUPPLIER                                      BABCOCK & WILCOX
    TYPE                                          PULVERIZED COAL, DRY BOTTOM
    SERVICE LOAD                                  BASE
    COMMERCIAL SERVICE DATE                        0/79
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S           372.82       ( 790036 ACFM)
    FLUE GAS TEMPERATURE - C                        143.3        ( 290 F)
    STACK HEIGHT - M                                152.         ( 498 FT)
    STACK TOP DIAMETER - M                        *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                     COAL
    FUEL GRADE                                    ******
    AVERAGE HEAT CONTENT - KJ/KG                   30261.        ( 13010 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                    ******
    AVERAGE ASH CONTENT - %                            8.80
    RANGE ASH CONTENT - %                         ******
    AVERAGE MOISTURE CONTENT - %                      11.40
    RANGE MOISTURE CONTENT - %                    ******
    AVERAGE SULFUR CONTENT - %                         4.50
    RANGE SULFUR CONTENT - %                      ******
    AVERAGE CHLORIDE CONTENT - %                  ********
    RANGE CHLORIDE CONTENT - %                    ******
    FUEL FIRING RATE - M T/H                      *******        (*** TPH)
    FUEL FIRING RATE - MW                         *****

** ESP
    NUMBER                                         1
    TYPE                                          COLD SIDE
    SUPPLIER                                      BUELL-ENVIROTECH

** FGD SYSTEM
    SALEABLE PRODUCT/THROWAWAY PRODUCT            THROWAWAY PRODUCT
    GENERAL PROCESS TYPE                          WET SCRUBBING
    PROCESS TYPE                                  DUAL ALKALI
    SYSTEM SUPPLIER                               FMC CORPORATION
    A-E FIRM                                      MID VALLEY DIVISION OF BROWN ROOT
    CONSTRUCTION FIRM                             MID VALLEY
    DEVELOPMENT LEVEL                             FULL-SCALE
    NEW/RETROFIT                                  NEW
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.50
    SO2 DESIGN REMOVAL EFFICIENCY - %                 85.00
    INITIAL START-UP                               3/79
    CONSTRUCTION INITIATION                       10/77
    CONTRACT AWARDED                              12/76
    STARTED REQUESTING BIDS                        4/76

** ABSORBER
    NUMBER                                         2
    TYPE                                          DISC CONTACTOR
    INITIAL START UP                               1/79
    SUPPLIER                                      FMC CORPORATION
    NUMBER OF STAGES                                3
    DIMENSIONS - FT                               62 HIGH X 32 DIA.
    SHELL MATERIAL                                CARBON STEEL
    SHELL LINER MATERIAL                          CEILCOTE
    BOILER LOAD/ABSORBER - %                          60.0
    GAS FLOW - CU.M/S                               237.84       ( 504000 ACFM)
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SOUTHERN INDIANA GAS & ELEC          (CONT.)

     GAS TEMPERATURE - C                              145.0          ( 293 F)
     SO2 INLET CONCENTRATION - PPM                   2810
     SO2 OUTLET CONTRATION - PPM                      520
     SO2 DESIGN REMOVAL EFFICIENCY - %                 85.0

** FANS
     NUMBER                                         2
     TYPE                                           BOOSTER

** VACUUM FILTER
     NUMBER                                         3
     TYPE                                           ROTARY DRUM

** MIST ELIMINATOR
     NUMBER                                         2
     TYPE                                           CHEVRON
     WASH SYSTEM                                    WASH ONCE/SHIFT

** PUMPS
     SERVICE                                        NUMBER
     -------                                        ------
     RECIRCULATION                                     1
     RECIRCULATION [SPARE]                             1

** TANKS
     SERVICE                                        NUMBER
     -------                                        ------
     REACTOR                                        ****
     SURGE TANK                                     ****

** THICKENER
     NUMBER                                         1
     DIAMETER - M                                     30.5          (100 FT)

** WATER LOOP
     TYPE                                           UNDECIDED (CAN BE OPERATED EITHER WAY)

** DISPOSAL
     NATURE                                         FINAL
     TYPE                                           LANDFILL
     LOCATION                                       ON-SITE


-----------------------------------------PERFORMANCE DATA---------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- -----------  ---- ----- ----- ------ ----- ------

 3/79  SYSTEM                                                               744

 4/79  SYSTEM                                                               720

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  3/79        END DATE  3/79
                        THE FGD SYSTEM BEGAN OPERATIONS ON MARCH 18, 1979.  NO OPERATIONAL DATA
                        ARE YET AVAILABLE.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	SOUTHERN MISSISSIPPI ELECTRIC	
PLANT NAME	R.D. MORROW	
UNIT NUMBER	1	
CITY	HATTISBURG	
STATE	MISSISSIPPI	
GROSS UNIT GENERATING CAPACITY - MW	200.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	180.0	
EQUIVALENT SCRUBBED CAPACITY - MW	124.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	27912.	(12000 BTU/LB)
AVERAGE ASH CONTENT - %	8.00	
AVERAGE MOISTURE CONTENT - %	6.50	
AVERAGE SULFUR CONTENT - %	1.30	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RILEY STOKER/ENVIRONEERING	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	5.5	
INITIAL START-UP DATE	8/78	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	85.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.60	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	*******	(***** GPM)
** TREATMENT		
TYPE	FLYASH STABILIZED	
** DISPOSAL		
TYPE	LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720	631		

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 4/79
THE BOILER RETURNED TO SERVICE ON APRIL 1 AFTER COMPLETION OF REPAIRS TO THE BOILER TUBES.

START DATE 4/79 END DATE 4/79
NO FGD SYSTEM RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR APRIL.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	SPRINGFIELD CITY UTILITIES	
PLANT NAME	SOUTHWEST	
UNIT NUMBER	1	
CITY	SPRINGFIELD	
STATE	MISSOURI	
GROSS UNIT GENERATING CAPACITY - MW	194.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	173.0	
EQUIVALENT SCRUBBED CAPACITY - MW	194.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - KJ/KG	29075.	(12500 BTU/LB)
AVERAGE ASH CONTENT - %	13.00	
AVERAGE MOISTURE CONTENT - %	********	
AVERAGE SULFUR CONTENT - %	3.50	
AVERAGE CHLORIDE CONTENT - %	.30	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	4.6	
INITIAL START-UP DATE	4/77	
COMMERCIAL START-UP DATE	**/**	
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.70	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	19.8	(315 GPM)
** TREATMENT		
TYPE	NONPROPRIETARY	
** DISPOSAL		
TYPE	LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	S-1	25.0									
	S-2	24.0	32.0	32.0	24.0						
	SYSTEM	24.5	16.0	16.0	12.1			672	508	81	71.4

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 2/79
THE S-1 MODULE EXPERIENCED PLUGGING PROBLEMS IN THE FIRST AND SECOND STAGE DURING FEBRUARY. ALSO DUE TO GAS LEAKAGE INTO THE MODULE CLEANING WAS DELAYED.

START DATE 2/79 END DATE 2/79
EXPANSION JOINT PROBLEMS AND BROKEN LINES WERE REPORTED.

START DATE 2/79 END DATE 2/79
A LACK OF SCRUBBING MEDIUM DURING THE LATTER PART OF FEBRUARY WAS REPORTED BY THE UTILITY.

START DATE 2/79 END DATE 2/79
THE S-2 MODULE PROBLEMS INCLUDED FROZEN VALVES AND LINES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	% REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/79	S-1	62.0	39.5	39.5	38.7						
	S-2	55.0	14.0	14.0	13.7						
	SYSTEM	58.5	26.8	26.8	26.2			744	730	195	52.8

PERFORMANCE DATA

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 3/79 END DATE 3/79
THE MAJORITY OF MODULE S-1 DOWNTIME WAS DUE TO A BROKEN SUPERNATE LINE AND MAKEUP CROSS TIE.

START DATE 3/79 END DATE 3/79
THE UTILITY REPORTED THAT THE MODULE WAS UNABLE TO RUN FOR A TIME DUE TO A DESIGN PROBLEM WITH A 500 HP MOTOR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/79	S-2	51.6	26.5	45.0	27.0						
	S-1	42.6	30.9	30.9	18.5						
	SYSTEM	47.1	37.9	50.4	22.8			720	432	164	

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 4/79 END DATE 4/79
MODULE S-1 EXPERIENCED AN EXPANSION JOINT FAILURE ON THE I.D. FAN DISCHARGE.

START DATE 4/79 END DATE 4/79
LOW DENSITY AT THE SLURRY HOLD TANK WAS A MAJOR PROBLEM.

START DATE 4/79 END DATE 4/79
SOME PLUGGING OF THE FIRST STAGE OF THE S-2 MODULE WAS REPORTED BY THE UTILITY.

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                                 SECTION 3
            DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------

COMPANY NAME                                TENNESSEE VALLEY AUTHORITY
PLANT NAME                                  SHAWNEE
UNIT NUMBER                                 10A
CITY                                        PADUCAH
STATE                                       KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW            10.0
NET UNIT GENERATING CAPACITY W/FGD - MW        10.0
EQUIVALENT SCRUBBED CAPACITY - MW              10.0

** FUEL DATA
    FUEL TYPE                               COAL
    FUEL GRADE                              BITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG            ******          (****** BTU/LB)
    AVERAGE ASH CONTENT - %                 ********
    AVERAGE MOISTURE CONTENT - %            ********
    AVERAGE SULFUR CONTENT - %                  2.90
    AVERAGE CHLORIDE CONTENT - %            ********

** FGD SYSTEM
    GENERAL PROCESS TYPE                    WET SCRUBBING
    PROCESS TYPE                            LIME/LIMESTONE
    SYSTEM SUPPLIER                         AIR CORRECTION DIVISION, UOP
    NEW/RETROFIT                            RETROFIT
    ENERGY CONSUMPTION - %                  *******
    INITIAL START-UP DATE                    4/72
    COMMERCIAL START-UP DATE                **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %       ********
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %  ********


---------------------------------------PERFORMANCE DATA------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                               SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 0/79  SYSTEM

        ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  0/72        END DATE  0/79
                 REFER TO PERFORMANCE UPDATE INFORMATION FOR SHAWNEE 10B.
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SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY
PLANT NAME	SHAWNEE
UNIT NUMBER	10P
CITY	PADUCAH
STATE	KENTUCKY
GROSS UNIT GENERATING CAPACITY - MW	10.0
NET UNIT GENERATING CAPACITY W/FGD - MW	10.0
EQUIVALENT SCRUBBED CAPACITY - MW	10.0
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - KJ/KG	****** (****** BTU/LB)
AVERAGE ASH CONTENT - %	********
AVERAGE MOISTURE CONTENT - %	********
AVERAGE SULFUR CONTENT - %	2.90
AVERAGE CHLORIDE CONTENT - %	********
** FGD SYSTEM	
GENERAL PROCESS TYPE	WET SCRUBBING
PROCESS TYPE	LIME/LIMESTONE
SYSTEM SUPPLIER	CHEMICO
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	*******
INITIAL START-UP DATE	4/72
COMMERCIAL START-UP DATE	**/**
SO2 DESIGN REMOVAL EFFICIENCY - %	********
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	********

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79

ONE TEST RUN WAS CONDUCTED ON EACH OF THE TWO SCRUBBER SYSTEMS IN EARLY FEBRUARY TO PROVIDE SAMPLES FOR LEVEL 1 BIOASSY TESTING BY LITTON BIONETICS CORPORATION UNDER CONTRACT WITH EPA. ACTUAL SAMPLING OF SLURRIES AND CONDENSATES FROM THE SCRUBBER AND OXIDATION TANK OFF-GASES WAS PERFORMED BY BATTELLE COLUMBUS LAPROATORY. FOR THIS PURPOSE. THE TCA WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AS A BASE CASE. AND THE VENTURI/SPRAY TOWER WAS OPERATED WITH LIMESTONE/FLYASH SLURRY AND WITH ADIPIC ACID ADDITIVE AND TWO-SCRUBBER-LOOP FORCED OXIDATION.

A SERIES OF TESTS WAS CONDUCTED ON THE VENTURI/SPRAY TOWER SYSTEM FORM MID-FEBRUARY THROUGH THE END OF MARCH TO SIMULATE THE PLANNED TVA WIDOWS CREEK UNIT 8 FULL-SCALE. TWO-SCRUBBER-LOOP FORCED-OXIDATION SCHEME. SPECIAL WIDOWS CREEK LIMESTONE (STONEMAN) AND COAL (PITTSBURGH MIDWAY) WERE USED AT SHAWNEE DURING THESE TESTS. NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH UP TO 6.0 AND AN AIR STOICHIOMETRY AS LOW AS 1.5 ATOMS OXYGEN/ MOLE SO2 ABSORBED. EXPECTED SLURRY CARRY-OVER FROM THE FIRST TO THE SECOND SCRUBBER LOOP AT WIDOWS CREEK WAS SIMULATED BY AN ARTIFICIAL BACKMIX STREAM OF UP TO 65 GPM.

A NEW LIME/ADIPIC ACID TEST BLOCK WITH AND WITHOUT FORCED OCIDATION BEGAN IN EARLY FEBRUARY ON THE SINGLE-LOOP TCA SYSTEM USING FLUE GAS WITH HIGH FLYASH LOADINGS. AT TCA INLET PH OF 7.0. 2400 TO 2900 PPM INLET SO2. L/G OF 50 GAL/ MCF, AND 15 INCHES TOTAL STATIC BED HEIGHT OF 1-7/8 INCH NITRILE FOAM SPHERES, SO2 REMOVALS WERE 83. 93. AND 97 PERCENT WITH ZERO, 600. AND 1200 PPM ADIPIC ACID, RESPECTIVELY, WITHOUT FORCED OXIDATION. SO2 REMOVAL REMAINED HIGH AT 91 PERCENT WITH 1200 PPM ADIPIC ACID WHEN L/G WAS REDUCED FROM 50 TO 37 GAL/MCF. WHEN OXIDATION WAS FORCED WITH ABOUT 1.8 AIR STOICHIOMETRY, NEAR COMPLETE SULFITE OXIDATION WAS ACHIEVED AT OXIDATION TANK PH (TCA INLET PH) UP TO ABOUT 5.5, AND 1200 PPM ADIPIC

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-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------
                                    ACID.  SO2 REMOVAL ABOVE 90 PERCENT WAS OBTAINED AT TCA INLET PH AS LOW
                                    AS 5.0 WITH FORCED OXIDATION.
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SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	TENNESSEE VALLEY AUTHORITY	
PLANT NAME	WIDOWS CREEK	
UNIT NUMBER	8	
CITY	BRIDGEPORT	
STATE	ALABAMA	
GROSS UNIT GENERATING CAPACITY - MW	550.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	516.0	
EQUIVALENT SCRUBBED CAPACITY - MW	550.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	******	
AVERAGE HEAT CONTENT - KJ/KG	23260.	(10000 BTU/LB)
AVERAGE ASH CONTENT - %	25.00	
AVERAGE MOISTURE CONTENT - %	10.00	
AVERAGE SULFUR CONTENT - %	4.30	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	TENNESSEE VALLEY AUTHORITY	
NEW/RETROFIT	RETROFIT	
ENERGY CONSUMPTION - %	*******	
INITIAL START-UP DATE	5/77	
COMMERCIAL START-UP DATE	1/78	
SO2 DESIGN REMOVAL EFFICIENCY - %	80.00	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.50	
** DISPOSAL		
TYPE	POND	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 3/79
CONSTRUCTION OF THE FORCED OXIDATION TEST WAS COMPLETED AND THE TESTING HAS BEGUN ALTHOUGH NO RESULTS ARE YET AVAILABLE (THIS TESTING IS BEING DONE ON ONE OF THE FOUR MODULES).

START DATE 2/79 END DATE 3/79
THE UNIT OUTAGE WHICH BEGAN IN OCTOBER AND WAS SCHEDULED TO END IN FEBRUARY CONTINUED THROUGH MARCH BECAUSE AFTER A FEW START-UPS THERE WERE BOILER AND TURBINE FAILURES.

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

COMPANY NAME	TEXAS UTILITIES	
PLANT NAME	MARTIN LAKE	
UNIT NUMBER	1	
CITY	TATUM	
STATE	TEXAS	
GROSS UNIT GENERATING CAPACITY - MW	793.0	
NET UNIT GENERATING CAPACITY W/FGD - MW	750.0	
EQUIVALENT SCRUBBED CAPACITY - MW	595.0	
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - KJ/KG	17166.	(7380 BTU/LB)
AVERAGE ASH CONTENT - %	8.00	
AVERAGE MOISTURE CONTENT - %	33.00	
AVERAGE SULFUR CONTENT - %	.90	
AVERAGE CHLORIDE CONTENT - %	********	
** FGD SYSTEM		
GENERAL PROCESS TYPE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	RESEARCH COTTRELL	
NEW/RETROFIT	NEW	
ENERGY CONSUMPTION - %	1.3	
INITIAL START-UP DATE	4/77	
COMMERCIAL START-UP DATE	8/77	
SO2 DESIGN REMOVAL EFFICIENCY - %	********	
PARTICULATE DESIGN REMOVAL EFFICIENCY - %	99.40	
** WATER LOOP		
TYPE	CLOSED	
FRESH MAKE-UP WATER - LITER/S	34.6	(550 GPM)
** TREATMENT		
TYPE	FLYASH STABILIZED	
** DISPOSAL		
TYPE	LANDFILL	

PERFORMANCE DATA

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL		PER	BOILER	FGD	CAP.
						SO2	PART.	HOURS	HOURS	HOURS	FACTOR
2/79	SYSTEM							672			
3/79	SYSTEM							744			
4/79	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

START DATE 2/79 END DATE 4/79
UNIT 1 IS NOW IN FULL OPERATION ALTHOUGH A SLUDGE DISPOSAS PROBLEM STILL EXISTS.

START DATE 2/79 END DATE 4/79
THE UTILITY HAS CHANGED THE LOUVER DAMPERS WITH GUILLOTINE DAMPERS WHICH SEEM TO WORK BETTER. HOWEVER, THEY STILL HAVE PROBLEMS WITH THE GUILLOTINE DAMPERS FAILING TO SEAL WHEN THEY BECOME SCALED

START DATE 2/79 END DATE 4/79
THERE HAS BEEN REPORTS OF TOWER LEAKS, FROM LINER FAILURE BUT IT DOESN'T SEEM TO BE SERIOUS.

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EPA UTILITY FGD SURVEY: FEBRUARY - MARCH 1979

                                   SECTION 3
                 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
------------------------------------------------------------------------------------------

  COMPANY NAME                                      TEXAS UTILITIES
  PLANT NAME                                        MARTIN LAKE
  UNIT NUMBER                                       2
  CITY                                              TATUM
  STATE                                             TEXAS
  GROSS UNIT GENERATING CAPACITY - MW                 793.0
  NET UNIT GENERATING CAPACITY W/FGD - MW             750.0
  EQUIVALENT SCRUBBED CAPACITY - MW                   595.0

 ** FUEL DATA
     FUEL TYPE                                      COAL
     FUEL GRADE                                     LIGNITE
     AVERAGE HEAT CONTENT - KJ/KG                   17166.        ( 7380 BTU/LB)
     AVERAGE ASH CONTENT - %                            8.00
     AVERAGE MOISTURE CONTENT - %                      33.00
     AVERAGE SULFUR CONTENT - %                          .90
     AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
     GENERAL PROCESS TYPE                           WET SCRUBBING
     PROCESS TYPE                                   LIMESTONE
     SYSTEM SUPPLIER                                RESEARCH COTTRELL
     NEW/RETROFIT                                   NEW
     ENERGY CONSUMPTION - %                            1.3
     INITIAL START-UP DATE                           5/78
     COMMERCIAL START-UP DATE                       **/**
     SO2 DESIGN REMOVAL EFFICIENCY - %              ********
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.40

 ** WATER LOOP
     TYPE                                           CLOSED
     FRESH MAKE-UP WATER - LITER/S                    34.6        ( 550 GPM)

 ** TREATMENT
     TYPE                                           FLYASH STABLIZATION

 ** DISPOSAL
     TYPE                                           LANDFILL


-------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS  HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                672

 3/79  SYSTEM                                                                744

 4/79  SYSTEM                                                                720

       ** PROBLEMS/SOLUTIONS/COMMENTS

           START DATE  2/79      END DATE  4/79
                       THERE HAS BEEN REPORTS OF TOWER LEAKS, FROM LINER FAILURE BUT IT SOESN'T
                       SEEM TO BE SERIOUS.

           START DATE  2/79      END DATE  4/79
                       UNIT 1 IS NOW IN FULL OPERATION ALTHOUGH A SLUDGE DISPOSAL PROBLEM STILL
                       EXISTS.

           START DATE  2/79      END DATE  4/79
                       THE UTILTIY HAS CHANGED THE LOUVER DAMPERS WITH GUILLOTINE DAMPERS WHICH
                       SEEM TO WORK BETTER.  HOWEVER, THEY STILL HAVE PROBLEMS WITH THE GUIL-
                       LOTINE DAMPERS FAILING TO SEAL WHEN THEY BECOME SCALED.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

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COMPANY NAME                                     TEXAS UTILITIES
PLANT NAME                                       MARTIN LAKE
UNIT NUMBER                                      3
CITY                                             TATUM
STATE                                            TEXAS
REGULATORY CLASSIFICATION                        A
PARTICULATE EMISSION LIMITATION - NG/J             43.          (  .100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    516.          ( 1.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               3000.0
GROSS UNIT GENERATING CAPACITY - MW               793.0
NET UNIT GENERATING CAPACITY W/FGD - MW           750.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          760.0
EQUIVALENT SCRUBBED CAPACITY - MW                 595.0

** BOILER DATA
   SUPPLIER                                      COMBUSTION ENGINEERING
   TYPE                                          ******
   SERVICE LOAD                                  BASE
   COMMERCIAL SERVICE DATE                       **/**
   MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         ********       (******* ACFM)
   FLUE GAS TEMPERATURE - C                      *******        (**** F)
   STACK HEIGHT - M                              ******         (**** FT)
   STACK TOP DIAMETER - M                        *******        (***** FT)

** FUEL DATA
   FUEL TYPE                                     COAL
   FUEL GRADE                                    LIGNITE
   AVERAGE HEAT CONTENT - KJ/KG                   17166.        (  7380 BTU/LB)
   RANGE HEAT CONTENT - BTU/LB                                   6972-7894
   AVERAGE ASH CONTENT - %                            8.00
   RANGE ASH CONTENT - %                         5.6-13.2
   AVERAGE MOISTURE CONTENT - %                      33.00
   RANGE MOISTURE CONTENT - %                    29.0-37.9
   AVERAGE SULFUR CONTENT - %                          .90
   RANGE SULFUR CONTENT - %                      0.5-1.5
   AVERAGE CHLORIDE CONTENT - %                  ********
   RANGE CHLORIDE CONTENT - %                    ******
   FUEL FIRING RATE - M T/H                        453.5        (500 TPH)
   FUEL FIRING RATE - MW                         *****

** ESP
   NUMBER                                         1
   TYPE                                          COLD SIDE
   SUPPLIER                                      RESEARCH-COTTRELL

** FGD SYSTEM
   SALEABLE PRODUCT/THROWAWAY PRODUCT            THROWAWAY PRODUCT
   GENERAL PROCESS TYPE                          WET SCRUBBING
   PROCESS TYPE                                  LIMESTONE
   SYSTEM SUPPLIER                               RESEARCH COTTRELL
   DEVELOPMENT LEVEL                             FULL-SCALE
   NEW/RETROFIT                                  NEW
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.40
   COMMERCIAL DATE                               12/78
   INITIAL START-UP                               2/79

** ABSORBER
   NUMBER                                        6
   TYPE                                          PACKED/SPRAY TOWER
   INITIAL START UP                              12/78
   NUMBER OF STAGES                                 3
   BOILER LOAD/ABSORBER - %                        12.5

** CENTRIFUGE
   NUMBER                                        3
   OUTLET SOLIDS - %                               69.0

** MIST ELIMINATOR
   NUMBER                                        6
   TYPE                                          CHEVRON
   NUMBER OF STAGES                                 2
```

```
EPA UTILITY FGD SURVEY: FEBRUARY - MARCH 1979

TEXAS UTILITIES                       (CONT.)


 ** PUMPS
      SERVICE                                    NUMBER
      -------                                    ------
      QUENCHER FEED PUMP                         ****
      ABSORBER FEED PUMPS                        ****

 ** TANKS
      SERVICE                                    NUMBER
      -------                                    ------
      ABSORBER FEED TANKS                          3

 ** REHEATER
      TYPE                                       BYPASS

 ** THICKENER
      NUMBER                                       1
      TYPE                                       GRAVITY
      DIAMETER - M                                 42.7         (140 FT)
      OUTLET SOLIDS - %                            35.0

 ** TREATMENT
      TYPE                                       FLYASH STABILIZATION
      SUPPLIER                                   NONPROPRIETARY

 ** DISPOSAL
      NATURE                                     FINAL
      TYPE                                       LANDFILL
      LOCATION                                   ON-SITE
      TRANSPORTATION                             RAIL


-----------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL    PER  BOILER   FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 3/79  SYSTEM
                                                                            744

 4/79  SYSTEM
                                                                            720

       ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  3/79        END DATE  4/79
                        MARTIN LAKE UNIT 3 BECAME OPERATIONAL DURING MARCH.  NO OPERATION DE-
                        TAILS ARE YET AVAILABLE.
```

SECTION 3
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS

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------------------------------------------------------------------------------------------------------------------
COMPANY NAME                                    TEXAS UTILITIES
PLANT NAME                                      MONTICELLO
UNIT NUMBER                                     3
CITY                                            MT. PLEASANT
STATE                                           TEXAS
GROSS UNIT GENERATING CAPACITY - MW               800.0
NET UNIT GENERATING CAPACITY W/FGD - MW           750.0
EQUIVALENT SCRUBBED CAPACITY - MW                 800.0

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  LIGNITE
    AVERAGE HEAT CONTENT - KJ/KG                ******           (****** BTU/LB)
    AVERAGE ASH CONTENT - %                        18.90
    AVERAGE MOISTURE CONTENT - %                ********
    AVERAGE SULFUR CONTENT - %                      1.50
    AVERAGE CHLORIDE CONTENT - %                     .04

** FGD SYSTEM
    GENERAL PROCESS TYPE                        WET SCRUBBING
    PROCESS TYPE                                LIMESTONE
    SYSTEM SUPPLIER                             CHEMICO
    NEW/RETROFIT                                NEW
    ENERGY CONSUMPTION - %                      *******
    INITIAL START-UP DATE                        5/78
    COMMERCIAL START-UP DATE                    10/78
    SO2 DESIGN REMOVAL EFFICIENCY - %              74.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %      99.50

** WATER LOOP
    TYPE                                        CLOSED
    FRESH MAKE-UP WATER - LITER/S                  34.4          (  546 GPM)

** TREATMENT
    TYPE                                        FLYASH STABILIZED

** DISPOSAL
    TYPE                                        LANDFILL


----------------------------------------------PERFORMANCE DATA----------------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                672

 3/79  SYSTEM                                                                744

 4/79  SYSTEM                                                                720

      ** PROBLEMS/SOLUTIONS/COMMENTS

            START DATE  2/79        END DATE  4/79
                        THE UNIT IS CURRENTLY DOWN FOR A SCHEDULED OVERHAUL.  THE TOWERS HAVE
                        BEEN INSPECTED AND NO SCALING WAS FOUND.

            START DATE  2/79        END DATE  4/79
                        SOME MINOR RECYCLE PUMP LINER PROBLEMS HAVE BEEN REPORTED.
```

```
COMPANY NAME                                    UTAH POWER & LIGHT
PLANT NAME                                      HUNTER
UNIT NUMBER                                     1
CITY                                            CASTLE DALE
STATE                                           UTAH
REGULATORY CLASSIFICATION                       A
PARTICULATE EMISSION LIMITATION - NG/J          ******        (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              *******
GROSS UNIT GENERATING CAPACITY - MW               400.0
NET UNIT GENERATING CAPACITY W/FGD - MW           400.0
NET UNIT GENERATING CAPACITY WO/FGD - MW        *******
EQUIVALENT SCRUBBED CAPACITY - MW                 360.0

** BOILER DATA
   SUPPLIER                                     ******
   TYPE                                         ******
   SERVICE LOAD                                 BASE
   COMMERCIAL SERVICE DATE                      **/**
   MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        ********      (******* ACFM)
   FLUE GAS TEMPERATURE - C                     *******       (**** F)
   STACK HEIGHT - M                             ******        (**** FT)
   STACK TOP DIAMETER - M                       *******       (***** FT)

** FUEL DATA
   FUEL TYPE                                    COAL
   FUEL GRADE                                   ******
   AVERAGE HEAT CONTENT - KJ/KG                  29075.       ( 12500 BTU/LB)
   RANGE HEAT CONTENT - BTU/LB                                 12,200 - 12,700
   AVERAGE ASH CONTENT - %                          10.00
   RANGE ASH CONTENT - %                        9 - 12
   AVERAGE MOISTURE CONTENT - %                      6.50
   RANGE MOISTURE CONTENT - %                   ******
   AVERAGE SULFUR CONTENT - %                         .55
   RANGE SULFUR CONTENT - %                     ******
   AVERAGE CHLORIDE CONTENT - %                 ********
   RANGE CHLORIDE CONTENT - %                   ******
   FUEL FIRING RATE - M T/H                     *******       (*** TPH)
   FUEL FIRING RATE - MW                        *****

** ESP
   NUMBER                                         1

** FGD SYSTEM
   SALEABLE PRODUCT/THROWAWAY PRODUCT           THROWAWAY PRODUCT
   GENERAL PROCESS TYPE                         WET SCRUBBING
   PROCESS TYPE                                 LIME
   SYSTEM SUPPLIER                              CHEMICO
   A-E FIRM                                     STEARNS & ROGER
   DEVELOPMENT LEVEL                            FULL-SCALE
   NEW/RETROFIT                                 NEW
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %       99.50
   SO2 DESIGN REMOVAL EFFICIENCY - %               80.00
   COMMERCIAL DATE                               3/79
   INITIAL START-UP                              5/79

** ABSORBER
   INITIAL START UP                             12/78
   SUPPLIER                                     CHEMICO

** REHEATER
   TYPE                                         BYPASS

** WATER LOOP
   TYPE                                         OPEN

** TREATMENT
   TYPE                                         FLYASH STABILIZATION

** DISPOSAL
   NATURE                                       FINAL
   TYPE                                         POND
```

```
UTAH POWER & LIGHT                    (CONT.)

     LOCATION                                      ON-SITE

------------------------------------------PERFORMANCE DATA------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 5/79  SYSTEM                                                                744

     ** PROBLEMS/SOLUTIONS/COMMENTS

          START DATE  5/79         END DATE  5/79
                   THE UNIT STARTED OPERATIONS ON MAY 21, 1979.
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                                   SECTION 3
                 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL FGD SYSTEMS
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 COMPANY NAME                                      UTAH POWER & LIGHT
 PLANT NAME                                        HUNTINGTON
 UNIT NUMBER                                       1
 CITY                                              PRICE
 STATE                                             UTAH
 GROSS UNIT GENERATING CAPACITY - MW                 430.0
 NET UNIT GENERATING CAPACITY W/FGD - MW             400.0
 EQUIVALENT SCRUBBED CAPACITY - MW                   366.0

 ** FUEL DATA
    FUEL TYPE                                      COAL
    FUEL GRADE                                     ******
    AVERAGE HEAT CONTENT - KJ/KG                   29075.        ( 12500 BTU/LB)
    AVERAGE ASH CONTENT - %                           10.00
    AVERAGE MOISTURE CONTENT - %                       6.50
    AVERAGE SULFUR CONTENT - %                          .55
    AVERAGE CHLORIDE CONTENT - %                   ********

 ** FGD SYSTEM
    GENERAL PROCESS TYPE                           WET SCRUBBING
    PROCESS TYPE                                   LIME
    SYSTEM SUPPLIER                                CHEMICO
    NEW/RETROFIT                                   NEW
    ENERGY CONSUMPTION - %                         *******
    INITIAL START-UP DATE                           5/78
    COMMERCIAL START-UP DATE                       **/**
    SO2 DESIGN REMOVAL EFFICIENCY - %                 80.00
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %         99.50

 ** WATER LOOP
    TYPE                                           CLOSED
    FRESH MAKE-UP WATER - LITER/S                     18.9        (  300 GPM)

 ** TREATMENT
    TYPE                                           NONPROPRIETARY FLYASH STABILIZED

 ** DISPOSAL
    TYPE                                           LANDFILL


-------------------------------------------PERFORMANCE DATA-------------------------------------------
PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION  % REMOVAL   PER  BOILER  FGD   CAP.
                                                                SO2  PART. HOURS HOURS  HOURS FACTOR
------ ------ ------------ ----------- ----------- ----------- ----- ----- ----- ------ ----- ------

 2/79  SYSTEM                                                                 672

 3/79  SYSTEM                                                                 744

        ** PROBLEMS/SOLUTIONS/COMMENTS

              START DATE  2/79        END DATE  3/79
                          NO INFORMATION WAS REPORTED BY THE UTILITY FOR THIS REPORT PERIOD.
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SECTION 4

SUMMARY OF FGD SYSTEMS BY COMPANY

COMPANY NAME	TOTAL		STATUS: OPERATIONAL		STATUS: CONSTRUCTION		STATUS: CONTRACT AWARDED		STATUS: PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ALABAMA ELECTRIC COOP	2	358.	1	179.	1	179.	0	0.	0	0.
ALLEGHENY POWER SYSTEM	3	1338.	1	519.	1	519.	0	0.	1	300.
ARIZONA ELECTRIC POWER COOP	2	390.	1	195.	1	195.	0	0.	0	0.
ARIZONA PUBLIC SERVICE	8	2684.	2	469.	4	705.	2	1510.	0	0.
ASSOCIATED ELECTRIC COOP	1	670.	0	0.	0	0.	1	670.	0	0.
BASIN ELECTRIC POWER COOP	5	2680.	0	0.	2	1200.	2	1040.	1	440.
BIG RIVERS ELECTRIC	2	484.	0	0.	2	484.	0	0.	0	0.
CENTRAL ILLINOIS LIGHT	2	832.	1	416.	0	0.	0	0.	1	416.
CENTRAL ILLINOIS PUBLIC SERV	1	617.	0	0.	1	617.	0	0.	0	0.
CENTRAL MAINE POWER	1	600.	0	0.	0	0.	0	0.	1	600.
CINCINNATI GAS & ELECTRIC	1	650.	0	0.	1	650.	0	0.	0	0.
COLORADO UTE ELECTRIC ASSN.	2	894.	0	0.	2	894.	0	0.	0	0.
COLUMBUS & SOUTHERN OHIO ELEC.	4	1572.	2	822.	0	0.	0	0.	2	750.
COMMONWEALTH EDISON	1	450.	0	0.	1	450.	0	0.	0	0.
COOPERATIVE POWER ASSOCIATION	2	654.	0	0.	2	654.	0	0.	0	0.
DELMARVA POWER & LIGHT	1	180.	0	0.	1	180.	0	0.	0	0.
DUQUESNE LIGHT	2	920.	2	920.	0	0.	0	0.	0	0.
EAST KENTUCKY POWER COOP	1	500.	0	0.	0	0.	1	500.	0	0.
GENERAL PUBLIC UTILITIES	2	1600.	0	0.	0	0.	0	0.	2	1600.
GULF POWER	1	23.	1	23.	0	0.	0	0.	0	0.
HOOSIER ENERGY	2	882.	0	0.	2	882.	0	0.	0	0.
HOUSTON LIGHTING & POWER CO.	1	512.	0	0.	0	0.	0	0.	1	512.
INDIANAPOLIS POWER & LIGHT	2	1062.	1	532.	1	530.	0	0.	0	0.
KANSAS CITY POWER & LIGHT	3	1054.	3	1054.	0	0.	0	0.	0	0.
KANSAS POWER & LIGHT	4	1575.	3	1085.	1	490.	0	0.	0	0.
KENTUCKY UTILITIES	1	64.	1	64.	0	0.	0	0.	0	0.
LAKELAND UTILITIES	1	364.	0	0.	0	0.	1	364.	0	0.
LOUISVILLE GAS & ELECTRIC	10	3533.	5	1180.	2	853.	1	350.	2	1150.
MIDDLE SOUTH UTILITIES	6	5340.	0	0.	0	0.	0	0.	6	5340.
MINNESOTA POWER & LIGHT	1	475.	0	0.	1	475.	0	0.	0	0.
MINNKOTA POWER COOPERATIVE	1	405.	1	405.	0	0.	0	0.	0	0.
MONTANA POWER	4	2120.	2	720.	0	0.	2	1400.	0	0.
MUSCATINE POWER & WATER	1	160.	0	0.	0	0.	0	0.	1	160.
NEVADA POWER	10	3125.	3	375.	0	0.	0	0.	7	2750.
NIAGARA MOHAWK POWER COOP	1	100.	0	0.	0	0.	1	100.	0	0.
NORTHERN INDIANA PUB SERVICE	5	1547.	1	115.	0	0.	0	0.	4	1432.
NORTHERN STATES POWER	3	2340.	2	1480.	0	0.	0	0.	1	860.
OTTER TAIL POWER	1	440.	0	0.	1	440.	0	0.	0	0.
PACIFIC GAS & ELECTRIC	2	1600.	0	0.	0	0.	0	0.	2	1600.
PACIFIC POWER & LIGHT	1	550.	0	0.	1	550.	0	0.	0	0.
PENNSYLVANIA POWER	3	2751.	2	1834.	1	917.	0	0.	0	0.
PHILADELPHIA ELECTRIC	4	844.	1	120.	0	0.	0	0.	3	724.
POTOMAC ELECTRIC POWER	1	800.	0	0.	0	0.	0	0.	1	800.
POWER AUTHORITY OF NEW YORK	1	700.	0	0.	0	0.	0	0.	1	700.
PUBLIC SERVICE OF INDIANA	1	650.	0	0.	0	0.	0	0.	1	650.
PUBLIC SERVICE OF NEW MEXICO	4	1779.	2	711.	1	534.	1	534.	0	0.
SALT RIVER PROJECT	3	840.	0	0.	2	560.	0	0.	1	280.
SAN MIGUEL ELECTRIC COOP	1	400.	0	0.	1	400.	0	0.	0	0.
SEMINOLE ELECTRIC	1	620.	0	0.	0	0.	0	0.	1	620.
SIKESTON BOARD OF MUNIC. UTIL.	1	235.	0	0.	1	235.	0	0.	0	0.
SOUTH CAROLINA PUBLIC SERVICE	3	700.	1	140.	1	280.	1	280.	0	0.
SOUTHERN CALIFORNIA EDISON	1	175.	0	0.	0	0.	1	175.	0	0.
SOUTHERN ILLINOIS POWER COOP	2	484.	0	0.	1	184.	0	0.	1	300.
SOUTHERN INDIANA GAS & ELEC	1	265.	1	265.	0	0.	0	0.	0	0.
SOUTHERN MISSISSIPPI ELECTRIC	2	248.	1	124.	1	124.	0	0.	0	0.
SOUTHWESTERN ELECTRIC POWER	1	720.	0	0.	0	0.	1	720.	0	0.
SPRINGFIELD CITY UTILITIES	1	194.	1	194.	0	0.	0	0.	0	0.
SPRINGFIELD WATER, LIGHT & PWR	1	205.	0	0.	1	205.	0	0.	0	0.
ST. JOE ZINC	1	60.	0	0.	1	60.	0	0.	0	0.
TAMPA ELECTRIC	1	450.	0	0.	0	0.	0	0.	1	450.
TENNESSEE VALLEY AUTHORITY	8	3753.	3	570.	1	575.	2	1408.	2	1200.
TEXAS MUNICIPAL POWER AGENCY	1	400.	0	0.	0	0.	1	400.	0	0.
TEXAS POWER & LIGHT	3	1882.	0	0.	1	382.	0	0.	2	1500.
TEXAS UTILITIES	8	5585.	4	2585.	0	0.	1	750.	3	2250.
UTAH POWER & LIGHT	3	1086.	2	726.	1	360.	0	0.	0	0.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUTING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 4
SUMMARY OF FGD SYSTEMS BY COMPANY

			STATUS							
	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
COMPANY NAME	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
WISCONSIN POWER & LIGHT	1	316.	0	0.	0	0.	1	316.	0	0.
TOTALS	162	71486.	51	17822.	42	15763.	20	10517.	49	27384.

NOTE - PLANNED STATUS INCLUDES LETTER OF INTENT SIGNED, REQUESTING/EVALUTING BIDS, AND CONSIDERING ONLY FGD SYSTEMS

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

			STATUS					
	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
ADL/COMBUSTION EQUIP ASSOCIATE								
DUAL ALKALI	1	288.	1	288.	0	0.	0	0.
LIME	3	1220.	2	720.	0	0.	1	500.
LIME/ALKALINE FLYASH	3	1805.	1	405.	0	0.	2	1400.
SODIUM CARBONATE	3	375.	3	375.	0	0.	0	0.
TOTAL -	10	3688.	7	1788.	0	0.	3	1900.
AIR CORRECTION DIVISION, UOP								
LIME	2	822.	2	822.	0	0.	0	0.
LIMESTONE	4	1896.	2	726.	1	450.	1	720.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
SODIUM CARBONATE	1	550.	0	0.	1	550.	0	0.
TOTAL -	8	3278.	5	1558.	2	1000.	1	720.
AMERICAN AIR FILTER								
LIME	6	1673.	3	694.	3	979.	0	0.
LIMESTONE	1	280.	0	0.	0	0.	1	280.
TOTAL -	7	1953.	3	694.	3	979.	1	280.
BABCOCK & WILCOX								
LIME	3	1688.	1	519.	2	1169.	0	0.
LIMESTONE	7	2477.	2	1014.	4	1099.	1	364.
LIME/SPRAY DRYING	1	600.	0	0.	0	0.	1	600.
TOTAL -	11	4765.	3	1533.	6	2268.	2	964.
BUELL/ENVIROTECH								
DUAL ALKALI	1	617.	0	0.	1	617.	0	0.
TOTAL -	1	617.	0	0.	1	617.	0	0.
BUREAU OF MINES								
CITRATE	1	60.	0	0.	1	60.	0	0.
TOTAL -	1	60.	0	0.	1	60.	0	0.
CHEMICO								
LIME	7	3840.	6	3480.	1	360.	0	0.
LIMESTONE	1	800.	1	800.	0	0.	0	0.
LIME/ALKALINE FLYASH	4	895.	0	0.	3	579.	1	316.
LIME/LIMESTONE	1	10.	1	10.	0	0.	0	0.
TOTAL -	13	5545.	8	4290.	4	939.	1	316.
CHIYODA INTERNATIONAL								
LIMESTONE/THOROUGHFRED 121	1	23.	1	23.	0	0.	0	0.
TOTAL -	1	23.	1	23.	0	0.	0	0.
COMBUSTION ENGINEERING								
LIME	6	1096.	4	442.	2	654.	0	0.
LIMESTONE	7	2932.	3	1085.	3	1447.	1	400.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.
LIME/LIMESTONE	2	708.	0	0.	1	358.	1	350.
TOTAL -	17	6216.	9	3007.	6	2459.	2	750.
DAVY POWERGAS								
WELLMAN LORD	6	2074.	3	826.	2	714.	1	534.
TOTAL -	6	2074.	3	826.	2	714.	1	534.
FMC CORPORATION								
DUAL ALKALI	1	265.	1	265.	0	0.	0	0.
TOTAL -	1	265.	1	265.	0	0.	0	0.
JOY MFG. CO. WESTERN PRECIPITA								
LIME/SPRAY DRYING	1	440.	0	0.	0	0.	1	440.
TOTAL -	1	440.	0	0.	0	0.	1	440.

SECTION 5
SUMMARY OF FGD SYSTEMS BY SYSTEM SUPPLIER

			STATUS					
	TOTAL		OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED	
SYSTEM SUPPLIER/PROCESS	NO.	MW	NO.	MW	NO.	MW	NO.	MW
MITSUBISHI INTERNATIONAL								
LIMESTONE	2	882.	0	0.	2	882.	0	0.
TOTAL -	2	882.	0	0.	2	882.	0	0.
PEABODY PROCESS SYSTEMS								
LIMESTONE	4	1252.	1	179.	3	1073.	0	0.
LIME/ALKALINE FLYASH	1	475.	0	0.	1	475.	0	0.
TOTAL -	5	1727.	1	179.	4	1548.	0	0.
PULLMAN KELLOGG								
LIME	1	917.	0	0.	1	917.	0	0.
LIMESTONE	3	1230.	0	0.	2	560.	1	670.
TOTAL -	4	2147.	0	0.	3	1477.	1	670.
RESEARCH COTTRELL								
LIMESTONE	13	5455.	6	2449.	6	2256.	1	750.
TOTAL -	13	5455.	6	2449.	6	2256.	1	750.
RILEY STOKER/ENVIRONEERING								
LIMESTONE	3	664.	2	540.	1	124.	0	0.
TOTAL -	3	664.	2	540.	1	124.	0	0.
ROCKWELL INTERNATIONAL								
AQUEOUS CARBONATE	1	100.	0	0.	0	0.	1	100.
TOTAL -	1	100.	0	0.	0	0.	1	100.
SO. CALIFORNIA EDISON/STEARNS-								
LIME	1	175.	0	0.	0	0.	1	175.
TOTAL -	1	175.	0	0.	0	0.	1	175.
TENNESSEE VALLEY AUTHORITY								
LIMESTONE	1	550.	1	550.	0	0.	0	0.
TOTAL -	1	550.	1	550.	0	0.	0	0.
UNITED ENGINEERS								
LIME	2	1510.	0	0.	0	0.	2	1510.
MAGNESIUM OXIDE	1	120.	1	120.	0	0.	0	0.
TOTAL -	3	1630.	1	120.	0	0.	2	1510.
VENDOR NOT SELECTED								
LIMESTONE	2	1408.	0	0.	0	0.	2	1408.
TOTAL -	2	1408.	0	0.	0	0.	2	1408.
WHEELABRATOR-FRYE/R.I.								
AQUEOUS CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.
TOTAL -	1	440.	0	0.	1	440.	0	0.
TOTAL -	113	44102.	51	17822.	42	15763.	20	10517.

SECTION 6
SUMMARY OF FGD SYSTEMS BY PROCESS

PROCESS	TOTAL		STATUS OPERATIONAL		CONSTRUCTION		CONTRACT AWARDED		PLANNED	
	NO.	MW	NO.	MW	NO.	MW	NO.	MW	NO.	MW
AQUEOUS CARBONATE	1	100.	0	0.	0	0.	1	100.	0	0.
CITRATE	1	60.	0	0.	1	60.	0	0.	0	0.
LIMESTONE/THOROUGHERED 121	1	23.	1	23.	0	0.	0	0.	0	0.
MAGNESIUM OXIDE	5	1444.	1	120.	0	0.	0	0.	4	1324.
WELLMAN LORD	6	2074.	3	826.	2	714.	1	534.	0	0.
SUBTOTAL - SALEABLE PRODUCT	14	3701.	5	969.	3	774.	2	634.	4	1324.
AQUEOUS CARBONATE/SPRAY DRYING	1	440.	0	0.	1	440.	0	0.	0	0.
DUAL ALKALI	3	1170.	2	553.	1	617.	0	0.	0	0.
LIME	31	12941.	18	6677.	9	4079.	4	2185.	0	0.
LIMESTONE	57	25614.	18	7343.	22	7891.	8	4592.	9	5788.
LIMESTONE/ALKALINE FLYASH	2	1480.	2	1480.	0	0.	0	0.	0	0.
LIME/ALKALINE FLYASH	8	3175.	1	405.	4	1054.	3	1716.	0	0.
LIME/LIMESTONE	5	1328.	2	20.	1	358.	1	350.	1	600.
LIME/SPRAY DRYING	2	1040.	0	0.	0	0.	2	1040.	0	0.
PROCESS NOT SELECTED	35	19672.	0	0.	0	0.	0	0.	35	19672.
SODIUM CARBONATE	4	925.	3	375.	1	550.	0	0.	0	0.
SUBTOTAL - THROWAWAY PRODUCT	148	67785.	46	16853.	39	14989.	18	9883.	45	26060.
TOTALS	162	71486.	51	17822.	42	15763.	20	10517.	49	27384.
SALEABLE % OF TOTAL MW		5		5		5		6		5

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
DUAL ALKALI				
A.B. BROWN	1	265.	3/79	0/ 0
CANE RUN	6	288.	3/79	0/ 0
		553.		
LIME				
BRUCE MANSFIELD	1	917.	12/75	6/76
BRUCE MANSFIELD	2	917.	7/77	10/77
CANE RUN	4	188.	8/76	9/77
CANE RUN	5	190.	12/77	5/79
COLSTRIP	1	360.	9/75	11/75
COLSTRIP	2	360.	5/76	10/76
CONESVILLE	5	411.	1/77	2/77
CONESVILLE	6	411.	6/78	6/78
ELRAMA	1-4	510.	10/75	10/75
GREEN RIVER	1-3	64.	9/75	6/76
HAWTHORN	3	90.	11/72	0/ 0
HAWTHORN	4	90.	8/72	0/ 0
HUNTER	1	360.	5/79	3/79
HUNTINGTON	1	366.	5/78	0/ 0
MILL CREEK	3	442.	8/78	3/79
PADDY'S RUN	6	72.	4/73	0/ 0
PHILLIPS	1-6	410.	7/73	0/ 0
PLEASANTS	1	519.	3/79	3/79
		6677.		
LIMESTONE				
APACHE	2	195.	8/78	1/79
CHOLLA	1	119.	10/73	12/73
CHOLLA	2	350.	4/78	0/ 0
DUCK CREEK	1	416.	7/76	8/78
JEFFREY	1	540.	8/78	8/78
LA CYGNE	1	874.	2/73	6/73
LAWRENCE	4	125.	1/76	0/ 0
LAWRENCE	5	420.	11/71	0/ 0
MARTIN LAKE	1	595.	4/77	8/77
MARTIN LAKE	2	595.	5/78	0/ 0
MARTIN LAKE	3	595.	2/79	12/78
MONTICELLO	3	800.	5/78	10/78
PETERSBURG	3	532.	12/77	12/77
R.D. MORROW	1	124.	8/78	0/ 0
SOUTHWEST	1	194.	4/77	0/ 0
TOMBIGBEE	2	179.	9/78	0/ 0
WIDOWS CREEK	8	550.	5/77	1/78
WINYAH	2	140.	7/77	0/ 0
		7343.		
LIMESTONE/ALKALINE FLYASH				
SHERBURNE	1	740.	3/76	5/76
SHERBURNE	2	740.	4/77	4/77
		1480.		
LIMESTONE/THOROUGHBRED 121				
SCHOLZ	1,2	23.	8/78	0/ 0
		23.		
LIME/ALKALINE FLYASH				
MILTON R. YOUNG	2	405.	9/77	6/78
		405.		
LIME/LIMESTONE				
SHAWNEE	10A	10.	4/72	0/ 0
SHAWNEE	10B	10.	4/72	0/ 0

SECTION 7
SUMMARY OF OPERATIONAL FGD SYSTEMS BY PROCESS AND UNIT

PROCESS/ UNIT NAME	UNIT NO.	CAPACITY MW	INITIAL STARTUP	COMMERCIAL STARTUP
		20.		
MAGNESIUM OXIDE				
EDDYSTONE	1A	120.	9/75	9/75
		120.		
SODIUM CARBONATE				
REID GARDNER	1	125.	4/74	0/ 0
REID GARDNER	2	125.	4/74	0/ 0
REID GARDNER	3	125.	6/76	7/76
		375.		
WELLMAN LORD				
DEAN H. MITCHELL	11	115.	7/76	6/77
SAN JUAN	1	361.	4/78	0/ 0
SAN JUAN	2	350.	8/78	0/ 0
		826.		
TOTAL		17822.		

SECTION 8

SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/		THROWAWAY		BYPRODUCT	
UNIT NAME	UNIT NO	STABILIZED	UNSTABILIZED	TYPE	DISPOSITION
DUAL ALKALI					
A.B. BROWN	1		LANDFILL		
CANE RUN	6		LINED POND		
LIME					
BRUCE MANSFIELD	1	LANDFILL			
BRUCE MANSFIELD	2	LANDFILL			
CANE RUN	4		LINED POND		
CANE RUN	5	LINED POND			
COLSTRIP	1		SLUDGE POND		
COLSTRIP	2		SLUDGE POND		
CONESVILLE	5	LANDFILL			
CONESVILLE	6	DIKED LANDFIL			
ELRAMA	1-4	LANDFILL			
GREEN RIVER	1-3		LINED POND		
HAWTHORN	3	UNLINED POND			
HAWTHORN	4	UNLINED POND			
HUNTER	1	POND			
HUNTINGTON	1	LANDFILL			
MILL CREEK	3	SLUDGE POND			
PADDY'S RUN	6	UNLINED POND			
PHILLIPS	1-6	LANDFILL			
PLEASANTS	1				
LIMESTONE					
APACHE	2		SLUDGE POND		
CHOLLA	1		UNLINED POND		
CHOLLA	2		SLUDGE POND		
DUCK CREEK	1		LINED POND		
JEFFREY	1	UNLINED POND			
LA CYGNE	1		UNLINED POND		
LAWRENCE	4	UNLINED POND			
LAWRENCE	5	UNLINED POND			
MARTIN LAKE	1	LANDFILL			
MARTIN LAKE	2	LANDFILL			
MARTIN LAKE	3	LANDFILL			
MONTICELLO	3	LANDFILL			
PETERSBURG	3	UNLINED POND			
R.D. MORROW	1	LANDFILL			
SOUTHWEST	1	LANDFILL			
TOMBIGBEE	2	LINED POND			
WIDOWS CREEK	8		POND		
WINYAH	2		UNLINED POND		
LIMESTONE/ALKALINE FLYASH					
SHERBURNE	1	LINED POND			
SHERBURNE	2	LINED POND			
LIMESTONE/THOROUGHBRED	121				
SCHOLZ	1.2			GYPSUM	STACKED IN POND
LIME/ALKALINE FLYASH					
MILTON R. YOUNG	2		MINEFILL		
LIME/LIMESTONE					
SHAWNEE	10A				
SHAWNEE	10B				
MAGNESIUM OXIDE					
EDDYSTONE	1A			SULFURIC ACID	

SECTION 8
SUMMARY OF END-PRODUCT DISPOSAL PRACTICES FOR OPERATIONAL FGD SYSTEMS

PROCESS/ UNIT NAME	UNIT NO	THROWAWAY STABILIZED	THROWAWAY UNSTABILIZED	BYPRODUCT TYPE	BYPRODUCT DISPOSITION
SODIUM CARBONATE					
REID GARDNER	1		EVAP POND		
REID GARDNER	2		EVAP POND		
REID GARDNER	3		EVAP POND		
WELLMAN LORD					
DEAN H. MITCHELL	11			ELEMENTAL SULFUR	
SAN JUAN	1		ASH POND	ELEMENTAL SULFUR	MARKETED
SAN JUAN	2		ASH POND	ELEMENTAL SULFUR	MARKETED

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALABAMA ELECTRIC COOP TOMBIGBEE	2	NEW	179.0	LIMESTONE PEABODY PROCESS SYSTEMS	9/78
ALLEGHENY POWER SYSTEM PLEASANTS	1	NEW	519.0	LIME BABCOCK & WILCOX	3/79
ARIZONA ELECTRIC POWER COOP APACHE	2	NEW	195.0	LIMESTONE RESEARCH COTTRELL	8/78
ARIZONA PUBLIC SERVICE CHOLLA	1	RETROFIT	119.0	LIMESTONE RESEARCH COTTRELL	10/73
ARIZONA PUBLIC SERVICE CHOLLA	2	NEW	350.0	LIMESTONE RESEARCH COTTRELL	4/78
CENTRAL ILLINOIS LIGHT DUCK CREEK	1	NEW	416.0	LIMESTONE RILEY STOKER/ENVIRONEERING	7/76
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE	5	NEW	411.0	LIME AIR CORRECTION DIVISION, UOP	1/77
COLUMBUS & SOUTHERN OHIO ELEC. CONESVILLE	6	NEW	411.0	LIME AIR CORRECTION DIVISION, UOP	6/78
DUQUESNE LIGHT ELRAMA	1-4	RETROFIT	510.0	LIME CHEMICO	10/75
DUQUESNE LIGHT PHILLIPS	1-6	RETROFIT	410.0	LIME CHEMICO	7/73
GULF POWER SCHOLZ	1,2	RETROFIT	23.0	LIMESTONE/THOROUGHBRED 121 CHIYODA INTERNATIONAL	8/78
INDIANAPOLIS POWER & LIGHT PETERSBURG	3	NEW	532.0	LIMESTONE AIR CORRECTION DIVISION, UOP	12/77
KANSAS CITY POWER & LIGHT HAWTHORN	3	RETROFIT	90.0	LIME COMBUSTION ENGINEERING	11/72
KANSAS CITY POWER & LIGHT HAWTHORN	4	RETROFIT	90.0	LIME COMBUSTION ENGINEERING	8/72
KANSAS CITY POWER & LIGHT LA CYGNE	1	NEW	874.0	LIMESTONE BABCOCK & WILCOX	2/73
KANSAS POWER & LIGHT JEFFREY	1	NEW	540.0	LIMESTONE COMBUSTION ENGINEERING	8/78
KANSAS POWER & LIGHT LAWRENCE	4	RETROFIT	125.0	LIMESTONE COMBUSTION ENGINEERING	1/76
KANSAS POWER & LIGHT LAWRENCE	5	RETROFIT	420.0	LIMESTONE COMBUSTION ENGINEERING	11/71
KENTUCKY UTILITIES GREEN RIVER	1-3	RETROFIT	64.0	LIME AMERICAN AIR FILTER	9/75
LOUISVILLE GAS & ELECTRIC CANE RUN	4	RETROFIT	188.0	LIME AMERICAN AIR FILTER	8/76
LOUISVILLE GAS & ELECTRIC CANE RUN	5	RETROFIT	190.0	LIME COMBUSTION ENGINEERING	12/77
LOUISVILLE GAS & ELECTRIC CANE RUN	6	RETROFIT	288.0	DUAL ALKALI ADL/COMBUSTION EQUIP ASSOCIATE	3/79
LOUISVILLE GAS & ELECTRIC MILL CREEK	3	NEW	442.0	LIME AMERICAN AIR FILTER	8/78
LOUISVILLE GAS & ELECTRIC PADDY'S RUN	6	RETROFIT	72.0	LIME COMBUSTION ENGINEERING	4/73

SECTION 9
SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
MINNKOTA POWER COOPERATIVE MILTON R. YOUNG	2	NEW	405.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	9/77
MONTANA POWER COLSTRIP	1	NEW	360.0	LIME ADL/COMBUSTION EQUIP ASSOCIATE	9/75
MONTANA POWER COLSTRIP	2	NEW	360.0	LIME ADL/COMBUSTION EQUIP ASSOCIATE	5/76
NEVADA POWER REID GARDNER	1	RETROFIT	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	4/74
NEVADA POWER REID GARDNER	2	RETROFIT	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	4/74
NEVADA POWER REID GARDNER	3	NEW	125.0	SODIUM CARBONATE ADL/COMBUSTION EQUIP ASSOCIATE	6/76
NORTHERN INDIANA PUB SERVICE DEAN H. MITCHELL	11	RETROFIT	115.0	WELLMAN LORD DAVY POWERGAS	7/76
NORTHERN STATES POWER SHERBURNE	1	NEW	740.0	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	3/76
NORTHERN STATES POWER SHERBURNE	2	NEW	740.0	LIMESTONE/ALKALINE FLYASH COMBUSTION ENGINEERING	4/77
PENNSYLVANIA POWER BRUCE MANSFIELD	1	NEW	917.0	LIME CHEMICO	12/75
PENNSYLVANIA POWER BRUCE MANSFIELD	2	NEW	917.0	LIME CHEMICO	7/77
PHILADELPHIA ELECTRIC EDDYSTONE	1A	RETROFIT	120.0	MAGNESIUM OXIDE UNITED ENGINEERS	9/75
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	1	RETROFIT	361.0	WELLMAN LORD DAVY POWERGAS	4/78
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	2	RETROFIT	350.0	WELLMAN LORD DAVY POWERGAS	8/78
SOUTH CAROLINA PUBLIC SERVICE WINYAH	2	NEW	140.0	LIMESTONE BABCOCK & WILCOX	7/77
SOUTHERN INDIANA GAS & ELEC A.B. BROWN	1	NEW	265.0	DUAL ALKALI FMC CORPORATION	3/79
SOUTHERN MISSISSIPPI ELECTRIC R.D. MORROW	1	NEW	124.0	LIMESTONE RILEY STOKER/ENVIRONEERING	8/78
SPRINGFIELD CITY UTILITIES SOUTHWEST	1	NEW	194.0	LIMESTONE AIR CORRECTION DIVISION, UOP	4/77
TENNESSEE VALLEY AUTHORITY SHAWNEE	10A	RETROFIT	10.0	LIME/LIMESTONE AIR CORRECTION DIVISION, UOP	4/72
TENNESSEE VALLEY AUTHORITY SHAWNEE	10B	RETROFIT	10.0	LIME/LIMESTONE CHEMICO	4/72
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	8	RETROFIT	550.0	LIMESTONE TENNESSEE VALLEY AUTHORITY	5/77
TEXAS UTILITIES MARTIN LAKE	1	NEW	595.0	LIMESTONE RESEARCH COTTRELL	4/77
TEXAS UTILITIES MARTIN LAKE	2	NEW	595.0	LIMESTONE RESEARCH COTTRELL	5/78
TEXAS UTILITIES MARTIN LAKE	3	NEW	595.0	LIMESTONE RESEARCH COTTRELL	2/79

SECTION 9

SUMMARY OF FGD SYSTEMS IN OPERATION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
TEXAS UTILITIES MONTICELLO	3	NEW	800.0	LIMESTONE CHEMICO	5/78
UTAH POWER & LIGHT HUNTER	1	NEW	360.0	LIME CHEMICO	5/79
UTAH POWER & LIGHT HUNTINGTON	1	NEW	366.0	LIME CHEMICO	5/78

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ALABAMA ELECTRIC COOP TOMBIGBEE	3	NEW	179.0	LIMESTONE PEABODY PROCESS SYSTEMS	6/79
ALLEGHENY POWER SYSTEM PLEASANTS	2	NEW	519.0	LIME BABCOCK & WILCOX	9/80
ARIZONA ELECTRIC POWER COOP APACHE	3	NEW	195.0	LIMESTONE RESEARCH COTTRELL	6/79
ARIZONA PUBLIC SERVICE CHOLLA	4	NEW	126.0	LIMESTONE RESEARCH COTTRELL	6/80
ARIZONA PUBLIC SERVICE FOUR CORNERS	1	RETROFIT	175.0	LIME/ALKALINE FLYASH CHEMICO	0/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	2	RETROFIT	175.0	LIME/ALKALINE FLYASH CHEMICO	0/79
ARIZONA PUBLIC SERVICE FOUR CORNERS	3	RETROFIT	229.0	LIME/ALKALINE FLYASH CHEMICO	0/79
BASIN ELECTRIC POWER COOP LARAMIE RIVER	1	NEW	600.0	LIMESTONE RESEARCH COTTRELL	4/80
BASIN ELECTRIC POWER COOP LARAMIE RIVER	2	NEW	600.0	LIMESTONE RESEARCH COTTRELL	10/80
BIG RIVERS ELECTRIC GREEN	1	NEW	242.0	LIME AMERICAN AIR FILTER	12/79
BIG RIVERS ELECTRIC GREEN	2	NEW	242.0	LIME AMERICAN AIR FILTER	12/80
CENTRAL ILLINOIS PUBLIC SERV NEWTON	1	NEW	617.0	DUAL ALKALI BUELL/ENVIROTECH	11/79
CINCINNATI GAS & ELECTRIC EAST BEND	2	NEW	650.0	LIME BABCOCK & WILCOX	10/81
COLORADO UTE ELECTRIC ASSN. CRAIG	1	NEW	447.0	LIMESTONE PEABODY PROCESS SYSTEMS	6/79
COLORADO UTE ELECTRIC ASSN. CRAIG	2	NEW	447.0	LIMESTONE PEABODY PROCESS SYSTEMS	11/79
COMMONWEALTH EDISON POWERTON	51	RETROFIT	450.0	LIMESTONE AIR CORRECTION DIVISION, UOP	10/79
COOPERATIVE POWER ASSOCIATION COAL CREEK	1	NEW	327.0	LIME COMBUSTION ENGINEERING	5/79
COOPERATIVE POWER ASSOCIATION COAL CREEK	2	NEW	327.0	LIME COMBUSTION ENGINEERING	10/80
DELMARVA POWER & LIGHT DELAWARE CITY	1-3	RETROFIT	180.0	WELLMAN LORD DAVY POWERGAS	4/80
HOOSIER ENERGY MEROM	1	NEW	441.0	LIMESTONE MITSUBISHI INTERNATIONAL	4/81
HOOSIER ENERGY MEROM	2	NEW	441.0	LIMESTONE MITSUBISHI INTERNATIONAL	1/82
INDIANAPOLIS POWER & LIGHT PETERSBURG	4	NEW	530.0	LIMESTONE RESEARCH COTTRELL	10/83
KANSAS POWER & LIGHT JEFFREY	2	NEW	490.0	LIMESTONE COMBUSTION ENGINEERING	6/80
LOUISVILLE GAS & ELECTRIC MILL CREEK	1	RETROFIT	358.0	LIME/LIMESTONE COMBUSTION ENGINEERING	4/81

SECTION 10
SUMMARY OF FGD SYSTEMS UNDER CONSTRUCTION

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
LOUISVILLE GAS & ELECTRIC MILL CREEK	4	NEW	495.0	LIME AMERICAN AIR FILTER	7/81
MINNESOTA POWER & LIGHT CLAY BOSWELL	4	NEW	475.0	LIME/ALKALINE FLYASH PEABODY PROCESS SYSTEMS	5/80
OTTER TAIL POWER COYOTE	1	NEW	440.0	AQUEOUS CARBONATE/SPRAY DRYING WHEELABRATOR-FRYE/R.I.	5/81
PACIFIC POWER & LIGHT JIM BRIDGER	4	NEW	550.0	SODIUM CARBONATE AIR CORRECTION DIVISION, UOP	9/79
PENNSYLVANIA POWER BRUCE MANSFIELD	3	NEW	917.0	LIME PULLMAN KELLOGG	4/80
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	3	NEW	534.0	WELLMAN LORD DAVY POWERGAS	6/79
SALT RIVER PROJECT CORONADO	1	NEW	280.0	LIMESTONE PULLMAN KELLOGG	8/79
SALT RIVER PROJECT CORONADO	2	NEW	280.0	LIMESTONE PULLMAN KELLOGG	1/80
SAN MIGUEL ELECTRIC COOP SAN MIGUEL	1	NEW	400.0	LIMESTONE BABCOCK & WILCOX	8/80
SIKESTON BOARD OF MUNIC. UTIL. SIKESTON	1	NEW	235.0	LIMESTONE BABCOCK & WILCOX	11/80
SOUTH CAROLINA PUBLIC SERVICE WINYAH	3	NEW	280.0	LIMESTONE BABCOCK & WILCOX	5/80
SOUTHERN ILLINOIS POWER COOP MARION	4	NEW	184.0	LIMESTONE BABCOCK & WILCOX	5/79
SOUTHERN MISSISSIPPI ELECTRIC R.D. MORROW	2	NEW	124.0	LIMESTONE RILEY STOKER/ENVIRONEERING	7/79
SPRINGFIELD WATER, LIGHT & PWR DALLMAN	3	NEW	205.0	LIMESTONE RESEARCH COTTRELL	7/80
ST. JOE ZINC G.F. WEATON	1	RETROFIT	60.0	CITRATE BUREAU OF MINES	7/79
TENNESSEE VALLEY AUTHORITY WIDOWS CREEK	7	RETROFIT	575.0	LIMESTONE COMBUSTION ENGINEERING	10/80
TEXAS POWER & LIGHT SANDOW	4	NEW	382.0	LIMESTONE COMBUSTION ENGINEERING	7/80
UTAH POWER & LIGHT HUNTER	2	NEW	360.0	LIME CHEMICO	6/80

SECTION 11
SUMMARY OF CONTRACT AWARDED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
ARIZONA PUBLIC SERVICE FOUR CORNERS	4	RETROFIT	755.0	LIME UNITED ENGINEERS	0/82
ARIZONA PUBLIC SERVICE FOUR CORNERS	5	RETROFIT	755.0	LIME UNITED ENGINEERS	0/82
ASSOCIATED ELECTRIC COOP THOMAS HILL	3	NEW	670.0	LIMESTONE PULLMAN KELLOGG	1/82
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	1	NEW	440.0	LIME/SPRAY DRYING JOY MFG. CO, WESTERN PRECIPITA	11/81
BASIN ELECTRIC POWER COOP LARAMIE RIVER	3	NEW	500.0	LIME/SPRAY DRYING BABCOCK & WILCOX	4/82
EAST KENTUCKY POWER COOP SPURLOCK	2	NEW	500.0	LIME ADL/COMBUSTION EQUIP ASSOCIATE	10/80
LAKELAND UTILITIES MCINTOSH	3	NEW	364.0	LIMESTONE BABCOCK & WILCOX	10/81
LOUISVILLE GAS & ELECTRIC MILL CREEK	2	RETROFIT	350.0	LIME/LIMESTONE COMBUSTION ENGINEERING	4/82
MONTANA POWER COLSTRIP	3	NEW	700.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	7/80
MONTANA POWER COLSTRIP	4	NEW	700.0	LIME/ALKALINE FLYASH ADL/COMBUSTION EQUIP ASSOCIATE	7/81
NIAGARA MOHAWK POWER COOP CHARLES R. HUNTLEY	66	RETROFIT	100.0	AQUEOUS CARBONATE ROCKWELL INTERNATIONAL	0/82
PUBLIC SERVICE OF NEW MEXICO SAN JUAN	4	NEW	534.0	WELLMAN LORD DAVY POWERGAS	1/82
SOUTH CAROLINA PUBLIC SERVICE WINYAH	4	NEW	280.0	LIMESTONE AMERICAN AIR FILTER	5/81
SOUTHERN CALIFORNIA EDISON ALAMITOS	6	RETROFIT	175.0	LIME SO. CALIFORNIA EDISON/STEARNS-	1/82
SOUTHWESTERN ELECTRIC POWER HENRY W. PERKEY	1	NEW	720.0	LIMESTONE AIR CORRECTION DIVISION, UOP	2/84
TENNESSEE VALLEY AUTHORITY PARADISE	1	RETROFIT	704.0	LIMESTONE VENDOR NOT SELECTED	6/82
TENNESSEE VALLEY AUTHORITY PARADISE	2	RETROFIT	704.0	LIMESTONE VENDOR NOT SELECTED	3/82
TEXAS MUNICIPAL POWER AGENCY GIBBONS CREEK	1	NEW	400.0	LIMESTONE COMBUSTION ENGINEERING	1/82
TEXAS UTILITIES MARTIN LAKE	4	NEW	750.0	LIMESTONE RESEARCH COTTRELL	0/85
WISCONSIN POWER & LIGHT COLUMBIA	2	RETROFIT	316.0	LIME/ALKALINE FLYASH CHEMICO	1/82

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
LETTER OF INTENT SIGNED					
NORTHERN STATES POWER SHERBURNE	3	NEW	860.0	LIMESTONE COMBUSTION ENGINEERING	5/84
PHILADELPHIA ELECTRIC EDDYSTONE	1B	RETROFIT	240.0	MAGNESIUM OXIDE UNITED ENGINEERS	6/80
REQUESTING/EVALUATING BIDS					
CENTRAL ILLINOIS LIGHT DUCK CREEK	2	NEW	416.0	LIMESTONE VENDOR NOT SELECTED	1/84
HOUSTON LIGHTING & POWER CO. W.A. PARISH	8	NEW	512.0	LIMESTONE VENDOR NOT SELECTED	10/82
MIDDLE SOUTH UTILITIES ARKANSAS COAL	5	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/86
MIDDLE SOUTH UTILITIES ARKANSAS COAL	6	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	1/88
MIDDLE SOUTH UTILITIES LOUISIANA COAL	1	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86
MIDDLE SOUTH UTILITIES LOUISIANA COAL	2	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/88
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL	1	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
MIDDLE SOUTH UTILITIES MISSISSIPPI COAL	2	NEW	890.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
NORTHERN INDIANA PUB SERVICE SCHAHFER	17	NEW	421.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/83
NORTHERN INDIANA PUB SERVICE SCHAHFER	18	NEW	421.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/85
PUBLIC SERVICE OF INDIANA GIBSON	5	NEW	650.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/82
TENNESSEE VALLEY AUTHORITY JOHNSONVILLE	1-10	RETROFIT	600.0	MAGNESIUM OXIDE TVA/UNITED ENGINEERS	0/82
TEXAS UTILITIES FOREST GROVE	1	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/81
CONSIDERING FGD SYSTEMS					
ALLEGHENY POWER SYSTEM MITCHELL	3	RETROFIT	300.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	8/82
BASIN ELECTRIC POWER COOP ANTELOPE VALLEY	2	NEW	440.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	11/83
CENTRAL MAINE POWER SEARS ISLAND	1	NEW	600.0	LIME/LIMESTONE VENDOR NOT SELECTED	11/87
COLUMBUS & SOUTHERN OHIO ELEC. POSTON	5	NEW	375.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/83
COLUMBUS & SOUTHERN OHIO ELEC. POSTON	6	NEW	375.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
GENERAL PUBLIC UTILITIES CONO	1	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/85
GENERAL PUBLIC UTILITIES SEWARD	7	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	12/85

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	1	NEW	575.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/84
LOUISVILLE GAS & ELECTRIC TRIMBLE COUNTY	2	NEW	575.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/84
MUSCATINE POWER & WATER MUSCATINE	9	NEW	160.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/82
NEVADA POWER HARRY ALLEN	1	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/85
NEVADA POWER HARRY ALLEN	2	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/86
NEVADA POWER HARRY ALLEN	3	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/87
NEVADA POWER HARRY ALLEN	4	NEW	500.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/88
NEVADA POWER REID GARDNER	4	NEW	250.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/83
NEVADA POWER WARNER VALLEY	1	NEW	250.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/84
NEVADA POWER WARNER VALLEY	2	NEW	250.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	6/85
NORTHERN INDIANA PUB SERVICE BAILLY	7	RETROFIT	190.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/ 0
NORTHERN INDIANA PUB SERVICE BAILLY	8	RETROFIT	400.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/ 0
PACIFIC GAS & ELECTRIC FOSSIL	1	NEW	800.0	LIMESTONE VENDOR NOT SELECTED	0/85
PACIFIC GAS & ELECTRIC FOSSIL	2	NEW	500.0	LIMESTONE VENDOR NOT SELECTED	0/86
PHILADELPHIA ELECTRIC CROMBY		RETROFIT	150.0	MAGNESIUM OXIDE UNITED ENGINEERS	6/80
PHILADELPHIA ELECTRIC EDDYSTONE	2	RETROFIT	334.0	MAGNESIUM OXIDE UNITED ENGINEERS	6/80
POTOMAC ELECTRIC POWER DICKERSON	4	NEW	800.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/87
POWER AUTHORITY OF NEW YORK ARTHUR KILL		NEW	700.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	11/88
SALT RIVER PROJECT CORONADO	3	NEW	280.0	LIMESTONE VENDOR NOT SELECTED	0/87
SEMINOLE ELECTRIC SEMINOLE	1	NEW	620.0	LIMESTONE VENDOR NOT SELECTED	6/83
SOUTHERN ILLINOIS POWER COOP MARION	5	NEW	300.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/84
TAMPA ELECTRIC BIG BEND	4	NEW	450.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
TENNESSEE VALLEY AUTHORITY CUMBERLAND		RETROFIT	600.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	7/82
TEXAS POWER & LIGHT TWIN OAKS	1	NEW	750.0	LIMESTONE VENDOR NOT SELECTED	2/83

SECTION 12
SUMMARY OF PLANNED FGD SYSTEMS

COMPANY NAME/ UNIT NAME	UNIT NO.	NEW OR RETROFIT	CAPACITY MW	PROCESS/ SYSTEM SUPPLIER	START-UP DATE
TEXAS POWER & LIGHT TWIN OAKS	2	NEW	750.0	LIMESTONE VENDOR NOT SELECTED	0/86
TEXAS UTILITIES MILL CREEK	1	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/85
TEXAS UTILITIES MILL CREEK	2	NEW	750.0	PROCESS NOT SELECTED VENDOR NOT SELECTED	0/86

SECTION 13

TOTAL FGD UNITS AND CAPACITY (MW) INSTALLED BY YEAR

YEAR	NEW ON LINE NO.	NEW ON LINE MW	TERMINATED NO.	TERMINATED MW	TOTAL ON LINE NO.	TOTAL ON LINE MW
1968	1	0.	0	0.	1	0.
1971	3	420.	0	0.	4	420.
1972	8	200.	0	0.	12	620.
1973	7	1475.	1	0.	18	2095.
1974	3	250.	0	0.	21	2345.
1975	6	1971.	0	0.	27	4316.
1976	8	2069.	1	0.	34	6385.
1977	10	4674.	0	0.	44	11059.
1978	13	4736.	0	0.	57	15795.
1979	22	7242.	0	0.	79	23037.
1980	23	9117.	0	0.	102	32154.
1981	10	4918.	0	0.	112	37072.
1982	19	9326.	0	0.	131	46398.
1983	7	3386.	0	0.	138	49784.
1984	7	3696.	1	250.	144	53230.
1985	11	6786.	0	0.	155	60016.
1986	6	4580.	0	0.	161	64596.
1987	6	3070.	0	0.	167	67666.
UNDEFINED	20	1240.				

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                    COMMONWEALTH EDISON
PLANT NAME                                      WILL COUNTY
UNIT NUMBER                                     1
CITY                                            ROMEOVILLE
STATE                                           ILLINOIS
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            0.            (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  774.            ( 1.800 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW             1147.0
GROSS UNIT GENERATING CAPACITY - MW             167.0
NET UNIT GENERATING CAPACITY W/FGD - MW         137.0
NET UNIT GENERATING CAPACITY WO/FGD - MW           .0
EQUIVALENT SCRUBBED CAPACITY - MW                  .0

** BOILER DATA
    SUPPLIER                                    BABCOCK & WILCOX
    TYPE                                        WET BOTTOM. CYCLONE
    SERVICE LOAD                                CYCLIC
    COMMERCIAL SERVICE DATE                      0/55
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         363.36         ( 770000 ACFM)
    FLUE GAS TEMPERATURE - C                      179.4          ( 355 F)
    STACK HEIGHT - M                              107.           ( 350 FT)
    STACK TOP DIAMETER - M                          3.8          ( 12.4 FT)

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  ******
    AVERAGE HEAT CONTENT - KJ/KG                 22260.          (  9570 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                     9,100 - 10,500
    AVERAGE ASH CONTENT - %                         7.40
    RANGE ASH CONTENT - %                       3 - 16
    AVERAGE MOISTURE CONTENT - %                ********
    RANGE MOISTURE CONTENT - %                  ******
    AVERAGE SULFUR CONTENT - %                      1.50
    RANGE SULFUR CONTENT - %                    0.3 - 4.5
    AVERAGE CHLORIDE CONTENT - %                ********
    RANGE CHLORIDE CONTENT - %                  ******
    FUEL FIRING RATE - M T/H                       77.1          ( 85 TPH)
    FUEL FIRING RATE - MW                         167

** ESP
    NUMBER                                        1
    TYPE                                        COLD SIDE
    SUPPLIER                                    WESTERN PRECIPITATION (JOY MANUFACTURING)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %     79.0
    FLUE GAS TEMPERATURE - C                      179.4          (  355 F)

** PARTICULATE SCRUBBER
    NUMBER                                        2
    TYPE                                        ADJUSTABLE THROAT VENTURI
    SUPPLIER                                    BABCOCK & WILCOX
    SHELL MATERIAL                              CARBON STEEL
    LINING MATERIAL                             PLASITE AND KAOCRETE
    TYPE OF NOZZLES                             STAINLESS STEEL
    FLUE GAS CAPACITY - CU.M/S                    181.7          ( 385000 ACFM)
    FLUE GAS TEMPERATURE - C                      179.4          (  355 F)
    LIQUID RECIRCULATION RATE - LITER/S           365.4          ( 5800 GPM)
    L/G RATIO - LITER/CU.M                          2.4          (18.0 GAL/1000ACF)
    PRESSURE DROP - KPA                             2.2          (     9 IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                 36.6          (  120.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                  .4          (   .16 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %      98.0
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                  DETROIT EDISON
PLANT NAME                                    ST. CLAIR
UNIT NUMBER                                   6
CITY                                          BELLE RIVER
STATE                                         MICHIGAN
REGULATORY CLASSIFICATION                     C
PARTICULATE EMISSION LIMITATION - NG/J        ******          (****** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                 1376.          ( 3.200 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW             1775.0
GROSS UNIT GENERATING CAPACITY - MW             325.0
NET UNIT GENERATING CAPACITY W/FGD - MW       *******
NET UNIT GENERATING CAPACITY WO/FGD - MW           .0
EQUIVALENT SCRUBBED CAPACITY - MW                  .0

** BOILER DATA
    SUPPLIER                                  COMBUSTION ENGINEERING
    TYPE                                      TWO-STAGE SUPERHEATER
    SERVICE LOAD                              BASE
    COMMERCIAL SERVICE DATE                    0/61
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S     ********        (******* ACFM)
    FLUE GAS TEMPERATURE - C                    132.2         ( 270 F)
    STACK HEIGHT - M                          ******          (**** FT)
    STACK TOP DIAMETER - M                    *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                SUBBITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG              *******         (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                9,500 - 9,600
    AVERAGE ASH CONTENT - %                        4.00
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %              ********
    RANGE MOISTURE CONTENT - %                22 - 24
    AVERAGE SULFUR CONTENT - %                ********
    RANGE SULFUR CONTENT - %                  0.3 - 0.4
    AVERAGE CHLORIDE CONTENT - %              ********
    RANGE CHLORIDE CONTENT - %                ******
    FUEL FIRING RATE - M T/H                    120.6         (133 TPH)
    FUEL FIRING RATE - MW                     *****

** ESP

** MECHANICAL COLLECTOR

** PARTICULATE SCRUBBER
    NUMBER                                     2
    TYPE                                      VENTURI
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                      MINNESOTA POWER & LIGHT
PLANT NAME                                        AURORA
UNIT NUMBER                                       1
CITY                                              AURORA
STATE                                             MINNESOTA
REGULATORY CLASSIFICATION                         ******
PARTICULATE EMISSION LIMITATION - NG/J               0.          (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                    ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                  116.0
GROSS UNIT GENERATING CAPACITY - MW               *******
NET UNIT GENERATING CAPACITY W/FGD - MW              58.0
NET UNIT GENERATING CAPACITY WO/FGD - MW               .0
EQUIVALENT SCRUBBED CAPACITY - MW                      .0

** BOILER DATA
   SUPPLIER                                       COMBUSTION ENGINEERING
   TYPE                                           PULVERIZED COAL
   SERVICE LOAD                                   ******
   COMMERCIAL SERVICE DATE                         0/53
   MAXIMUM BOILER FLUE GAS FLOW - CU.M/S          ********       (******* ACFM)
   FLUE GAS TEMPERATURE - C                       *******        (**** F)
   STACK HEIGHT - M                               ******         (**** FT)
   STACK TOP DIAMETER - M                         *******        (***** FT)

** FUEL DATA
   FUEL TYPE                                      COAL
   FUEL GRADE                                     SUBBITUMINOUS
   AVERAGE HEAT CONTENT - KJ/KG                    20469.        (  8800 BTU/LB)
   RANGE HEAT CONTENT - BTU/LB                                    ******
   AVERAGE ASH CONTENT - %                        ********
   RANGE ASH CONTENT - %                          ******
   AVERAGE MOISTURE CONTENT - %                      26.70
   RANGE MOISTURE CONTENT - %                     ******
   AVERAGE SULFUR CONTENT - %                         1.37
   RANGE SULFUR CONTENT - %                       ******
   AVERAGE CHLORIDE CONTENT - %                   ********
   RANGE CHLORIDE CONTENT - %                     ******
   FUEL FIRING RATE - M T/H                       *******        (*** TPH)
   FUEL FIRING RATE - MW                          *****

** PARTICULATE SCRUBBER
   NUMBER                                         1
   TYPE                                           ELBAIR SPRAY-IMPINGEMENT
   SUPPLIER                                       KREBS ENGINEERING
   SHELL MATERIAL                                 316 ELC STAINLESS STEEL
   LINING MATERIAL                                FLAKE-POLYESTER
   BOILER LOAD/SCRUBBER - %                         100.0
   FLUE GAS CAPACITY - CU.M/S                       137.4        ( 291160 ACFM)
   FLUE GAS TEMPERATURE - C                         171.1        (  340 F)
   L/G RATIO - LITER/CU.M                             1.1        ( 8.3 GAL/1000ACF)
   PRESSURE DROP - KPA                                 .7        (     3 IN-H2O)
   SUPERFICIAL GAS VELOCITY - M/S                     2.1        (   7.0 FT/S)
   PARTICULATE INLET LOAD - G/CU.M                    4.7        (  2.06 GR/SCF)
   PARTICULATE OUTLET LOAD - G/CU.M                    .1        (  .040 GR/SCF)
   SO2 INLET CONCENTRATION - PPM                  800.000
   SO2 OUTLET CONCENTRATION - PPM                 500.000
   SO2 DESIGN REMOVAL EFFICIENCY - %                 37.0
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                  MINNESOTA POWER & LIGHT
PLANT NAME                                    AURORA
UNIT NUMBER                                   2
CITY                                          AURORA
STATE                                         MINNESOTA
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J          0.         (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******       (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW             116.0
GROSS UNIT GENERATING CAPACITY - MW           *******
NET UNIT GENERATING CAPACITY W/FGD - MW         58.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          .0
EQUIVALENT SCRUBBED CAPACITY - MW                 .0

** BOILER DATA
     SUPPLIER                                 COMBUSTION ENGINEERING
     TYPE                                     PULVERIZED COAL
     SERVICE LOAD                             ******
     COMMERCIAL SERVICE DATE                   0/53
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S    ********     (******* ACFM)
     FLUE GAS TEMPERATURE - C                 *******      (**** F)
     STACK HEIGHT - M                         ******       (**** FT)
     STACK TOP DIAMETER - M                   *******      (***** FT)

** FUEL DATA
     FUEL TYPE                                COAL
     FUEL GRADE                               SUBBITUMINOUS
     AVERAGE HEAT CONTENT - KJ/KG              20469.      (  8800 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                              ******
     AVERAGE ASH CONTENT - %                  ********
     RANGE ASH CONTENT - %                    ******
     AVERAGE MOISTURE CONTENT - %                26.70
     RANGE MOISTURE CONTENT - %               ******
     AVERAGE SULFUR CONTENT - %                   1.37
     RANGE SULFUR CONTENT - %                 ******
     AVERAGE CHLORIDE CONTENT - %             ********
     RANGE CHLORIDE CONTENT - %               ******
     FUEL FIRING RATE - M T/H                 *******      (*** TPH)
     FUEL FIRING RATE - MW                    *****

** PARTICULATE SCRUBBER
     NUMBER                                    1
     TYPE                                     ELBAIR SPRAY-IMPINGEMENT
     SUPPLIER                                 KREBS ENGINEERING
     SHELL MATERIAL                           316 ELC STAINLESS STEEL
     LINING MATERIAL                          FLAKE-POLYESTER
     BOILER LOAD/SCRUBBER - %                  100.0
     FLUE GAS CAPACITY - CU.M/S                137.4       ( 291160 ACFM)
     FLUE GAS TEMPERATURE - C                  171.1       (  340 F)
     L/G RATIO - LITER/CU.M                      1.1       ( 8.3 GAL/1000ACF)
     PRESSURE DROP - KPA                          .7       (     3 IN-H2O)
     SUPERFICIAL GAS VELOCITY - M/S              2.1       (     7.0 FT/S)
     PARTICULATE INLET LOAD - G/CU.M             4.7       (  2.06 GR/SCF)
     PARTICULATE OUTLET LOAD - G/CU.M             .1       (  .040 GR/SCF)
     SO2 INLET CONCENTRATION - PPM             800.000
     SO2 OUTLET CONCENTRATION - PPM            500.000
     SO2 DESIGN REMOVAL EFFICIENCY - %          37.0
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                                 SECTION 14
       DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
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COMPANY NAME                                     MONTANA-DAKOTA UTILITIES CO.
PLANT NAME                                       LEWIS & CLARK
UNIT NUMBER                                      ******
CITY                                             ******
STATE                                            ******
REGULATORY CLASSIFICATION                        ******
PARTICULATE EMISSION LIMITATION - NG/J               0.          (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               *******
GROSS UNIT GENERATING CAPACITY - MW              *******
NET UNIT GENERATING CAPACITY W/FGD - MW          *******
NET UNIT GENERATING CAPACITY WO/FGD - MW              .0
EQUIVALENT SCRUBBED CAPACITY - MW                     .0

** BOILER DATA
    SUPPLIER                                     ******
    TYPE                                         ******
    SERVICE LOAD                                 ******
    COMMERCIAL SERVICE DATE                      **/**
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        *********       (******* ACFM)
    FLUE GAS TEMPERATURE - C                     *******         (**** F)
    STACK HEIGHT - M                             ******          (**** FT)
    STACK TOP DIAMETER - M                       *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   LIGNITE
    AVERAGE HEAT CONTENT - KJ/KG                 *******         (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                   ******
    AVERAGE ASH CONTENT - %                          9.00
    RANGE ASH CONTENT - %                        ******
    AVERAGE MOISTURE CONTENT - %                 ********
    RANGE MOISTURE CONTENT - %                   ******
    AVERAGE SULFUR CONTENT - %                        .45
    RANGE SULFUR CONTENT - %                     ******
    AVERAGE CHLORIDE CONTENT - %                 ********
    RANGE CHLORIDE CONTENT - %                   ******
    FUEL FIRING RATE - M T/H                     *******         (*** TPH)
    FUEL FIRING RATE - MW                        *****

** MECHANICAL COLLECTOR
    NUMBER                                       1

** PARTICULATE SCRUBBER
    TYPE                                         VENTURI-FLOODED DISC
    SUPPLIER                                     RESEARCH COTTERELL
    L/G RATIO - LITER/CU.M                           1.7         (13.0 GAL/1000ACF)
    PRESSURE DROP - KPA                              3.2         (   13 IN-H2O)
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                                        SECTION 14
              DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
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COMPANY NAME                                    PACIFIC POWER & LIGHT
PLANT NAME                                      DAVE JOHNSTON
UNIT NUMBER                                     4
CITY                                            GLENROCK
STATE                                           WYOMING
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J             0.          (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              *******
GROSS UNIT GENERATING CAPACITY - MW             *******
NET UNIT GENERATING CAPACITY W/FGD - MW           330.0
NET UNIT GENERATING CAPACITY WO/FGD - MW             .0
EQUIVALENT SCRUBBED CAPACITY - MW                    .0

** BOILER DATA
     SUPPLIER                                   COMBUSTION ENGINEERING
     TYPE                                       PULVERIZED COAL
     SERVICE LOAD                               ******
     COMMERCIAL SERVICE DATE                    **/**
     MAXIMUM BOILER FLUE GAS FLOW - CU.M/S      ********       (******* ACFM)
     FLUE GAS TEMPERATURE - C                   *******        (**** F)
     STACK HEIGHT - M                             76.          ( 250 FT)
     STACK TOP DIAMETER - M                     *******        (***** FT)

** FUEL DATA
     FUEL TYPE                                  COAL
     FUEL GRADE                                 SUBBITUMINOUS
     AVERAGE HEAT CONTENT - KJ/KG                17282.        (  7430 BTU/LB)
     RANGE HEAT CONTENT - BTU/LB                                 ******
     AVERAGE ASH CONTENT - %                        12.00
     RANGE ASH CONTENT - %                      ******
     AVERAGE MOISTURE CONTENT - %                   26.00
     RANGE MOISTURE CONTENT - %                 ******
     AVERAGE SULFUR CONTENT - %                       .50
     RANGE SULFUR CONTENT - %                   ******
     AVERAGE CHLORIDE CONTENT - %                     .04
     RANGE CHLORIDE CONTENT - %                 ******
     FUEL FIRING RATE - M T/H                   *******        (*** TPH)
     FUEL FIRING RATE - MW                      *****

** ESP

** PARTICULATE SCRUBBER
     NUMBER                                      3
     TYPE                                       VENTURI
     SUPPLIER                                   CHEMICO
     LINING MATERIAL                            POLYESTER-LINED STEEL
     FLUE GAS CAPACITY - CU.M/S                   327.5        ( 694000 ACFM)
     FLUE GAS TEMPERATURE - C                     135.0        (  275 F)
     LIQUID RECIRCULATION RATE - LITER/S          409.5        ( 6500 GPM)
     L/G RATIO - LITER/CU.M                         1.3        ( 9.4 GAL/1000ACF)
     PRESSURE DROP - KPA                            2.5        (    10 IN-H2O)
     PARTICULATE INLET LOAD - G/CU.M                9.2        (  4.00 GR/SCF)
     PARTICULATE DESIGN REMOVAL EFFICIENCY - %     99.7
     SO2 INLET CONCENTRATION - PPM                459.000
     SO2 DESIGN REMOVAL EFFICIENCY - %             40.0
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                                              SECTION 14
                            DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
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    COMPANY NAME                                      POTOMAC ELECTRIC POWER
    PLANT NAME                                        CHALK POINT
    UNIT NUMBER                                       4
    CITY                                              ******
    STATE                                             MARYLNAD
    REGULATORY CLASSIFICATION                         ******
    PARTICULATE EMISSION LIMITATION - NG/J                0.           (  .000 LB/MMBTU)
    SO2 EMISSION LIMITATION - NG/J                    ******           (****** LB/MMBTU)
    NET PLANT GENERATING CAPACITY - MW                 1892.0
    GROSS UNIT GENERATING CAPACITY - MW                 630.0
    NET UNIT GENERATING CAPACITY W/FGD - MW             630.0
    NET UNIT GENERATING CAPACITY WO/FGD - MW               .0
    EQUIVALENT SCRUBBED CAPACITY - MW                      .0

    ** BOILER DATA
         SUPPLIER                                     ******
         TYPE                                         ******
         SERVICE LOAD                                 BASE
         COMMERCIAL SERVICE DATE                      **/**
         MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        ********         (******* ACFM)
         FLUE GAS TEMPERATURE - C                     *******          (**** F)
         STACK HEIGHT - M                             ******           (**** FT)
         STACK TOP DIAMETER - M                       *******          (***** FT)

    ** FUEL DATA
         FUEL TYPE                                    OIL
         FUEL GRADE                                   ******
         AVERAGE HEAT CONTENT - KJ/KG                 *******          (****** BTU/LB)
         RANGE HEAT CONTENT - BTU/LB                                    ******
         AVERAGE ASH CONTENT - %                      ********
         RANGE ASH CONTENT - %                        ******
         AVERAGE MOISTURE CONTENT - %                 ********
         RANGE MOISTURE CONTENT - %                   ******
         AVERAGE SULFUR CONTENT - %                   ********
         RANGE SULFUR CONTENT - %                     ******
         AVERAGE CHLORIDE CONTENT - %                 ********
         RANGE CHLORIDE CONTENT - %                   ******
         FUEL FIRING RATE - M T/H                     *******          (*** TPH)
         FUEL FIRING RATE - MW                        *****
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SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                  POTOMAC ELECTRIC POWER
PLANT NAME                                    DICKERSON
UNIT NUMBER                                   3
CITY                                          DICKERSON
STATE                                         MARYLAND
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J          0.          (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                688.          ( 1.600 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW            548.0
GROSS UNIT GENERATING CAPACITY - MW           190.0
NET UNIT GENERATING CAPACITY W/FGD - MW       183.0
NET UNIT GENERATING CAPACITY WO/FGD - MW         .0
EQUIVALENT SCRUBBED CAPACITY - MW                .0

** BOILER DATA
    SUPPLIER                                  COMBUSTION ENGINEERING
    TYPE                                      PULVERIZED COAL, DRY BOTTOM
    SERVICE LOAD                              BASE
    COMMERCIAL SERVICE DATE                    0/62
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S      278.42       ( 590000 ACFM)
    FLUE GAS TEMPERATURE - C                   126.1        ( 259 F)
    STACK HEIGHT - M                           122.         ( 400 FT)
    STACK TOP DIAMETER - M                    *******       (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                ******
    AVERAGE HEAT CONTENT - KJ/KG               27214.       ( 11700 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                               ******
    AVERAGE ASH CONTENT - %                      14.00
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %              ********
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                    2.00
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %              ********
    RANGE CHLORIDE CONTENT - %                ******
    FUEL FIRING RATE - M T/H                     67.1       ( 74 TPH)
    FUEL FIRING RATE - MW                     *****

** ESP
    NUMBER                                     1
    SUPPLIER                                  RESEARCH-COTTRELL
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %    94.0

** PARTICULATE SCRUBBER
    NUMBER                                     1
    TYPE                                      ADJUSTABLE VENTURI
    SUPPLIER                                  CHEMICO
    BOILER LOAD/SCRUBBER - %                    50.0
    FLUE GAS CAPACITY - CU.M/S                 139.2        ( 295000 ACFM)
    FLUE GAS TEMPERATURE - C                   126.1        (  259 F)
    L/G RATIO - LITER/CU.M                       2.7        (20.0 GAL/1000ACF)
    PRESSURE DROP - KPA                          2.7        (    11 IN-H2O)
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                                   SECTION 14
                DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS
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COMPANY NAME                                     PUBLIC SERVICE OF COLORADO
PLANT NAME                                       ARAPAHOE
UNIT NUMBER                                      4
CITY                                             DENVER
STATE                                            COLORADO
REGULATORY CLASSIFICATION                        ******
PARTICULATE EMISSION LIMITATION - NG/J               0.          ( .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                   ******          (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               *******
GROSS UNIT GENERATING CAPACITY - MW              *******
NET UNIT GENERATING CAPACITY W/FGD - MW            112.0
NET UNIT GENERATING CAPACITY WO/FGD - MW              .0
EQUIVALENT SCRUBBED CAPACITY - MW                     .0

** BOILER DATA
    SUPPLIER                                     ******
    TYPE                                         PULVERIZED COAL
    SERVICE LOAD                                 ******
    COMMERCIAL SERVICE DATE                       0/55
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S        ********        (******* ACFM)
    FLUE GAS TEMPERATURE - C                     *******         (**** F)
    STACK HEIGHT - M                             ******          (**** FT)
    STACK TOP DIAMETER - M                       *******         (***** FT)

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   SUBBITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG                  23725.         ( 10200 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                   ******
    AVERAGE ASH CONTENT - %                           9.30
    RANGE ASH CONTENT - %                        ******
    AVERAGE MOISTURE CONTENT - %                     13.70
    RANGE MOISTURE CONTENT - %                   ******
    AVERAGE SULFUR CONTENT - %                         .95
    RANGE SULFUR CONTENT - %                     ******
    AVERAGE CHLORIDE CONTENT - %                       .01
    RANGE CHLORIDE CONTENT - %                   ******
    FUEL FIRING RATE - M T/H                     *******         (*** TPH)
    FUEL FIRING RATE - MW                        *****

** FUEL DATA
    FUEL TYPE                                    COAL
    FUEL GRADE                                   ******
    AVERAGE HEAT CONTENT - KJ/KG                  23493.         ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                   ******
    AVERAGE ASH CONTENT - %                          12.50
    RANGE ASH CONTENT - %                        ******
    AVERAGE MOISTURE CONTENT - %                     11.20
    RANGE MOISTURE CONTENT - %                   ******
    AVERAGE SULFUR CONTENT - %                         .65
    RANGE SULFUR CONTENT - %                     ******
    AVERAGE CHLORIDE CONTENT - %                       .01
    RANGE CHLORIDE CONTENT - %                   ******
    FUEL FIRING RATE - M T/H                     *******         (*** TPH)
    FUEL FIRING RATE - MW                        *****

** ESP
    NUMBER                                         1

** MECHANICAL COLLECTOR
    NUMBER                                         1

** PARTICULATE SCRUBBER
    NUMBER        .                                1
    TYPE                                         TCA
    SUPPLIER                                     UOP
    NUMBER OF STAGES                                  3
    SHELL MATERIAL                               CARBON STEEL
    LINING MATERIAL                              RUBBER
    INTERNAL MATERIAL                            STAINLESS STEEL
    L/G RATIO - LITER/CU.M                            7.5        (56.0 GAL/1000ACF)
    SUPERFICIAL GAS VELOCITY - M/S                    3.4        (    11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M                   1.8        (    .80 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M                   .0        (   .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %       93.0
    SO2 INLET CONCENTRATION - PPM                  500.000
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SO2 OUTLET CONCENTRATION - PPM	350.000
SO2 DESIGN REMOVAL EFFICIENCY - %	30.0

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                  PUBLIC SERVICE OF COLORADO
PLANT NAME                                    CHEROKEE
UNIT NUMBER                                   1
CITY                                          DENVER
STATE                                         COLORADO
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J           0.          (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******         (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW              710.0
GROSS UNIT GENERATING CAPACITY - MW             115.0
NET UNIT GENERATING CAPACITY W/FGD - MW         100.0
NET UNIT GENERATING CAPACITY WO/FGD - MW           .0
EQUIVALENT SCRUBBED CAPACITY - MW                  .0

** BOILER DATA
    SUPPLIER                                  BABCOCK & WILCOX
    TYPE                                      PULVERIZED COAL
    SERVICE LOAD                              ******
    COMMERCIAL SERVICE DATE                    0/57
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S     ********       (******* ACFM)
    FLUE GAS TEMPERATURE - C                  *******        (**** F)
    STACK HEIGHT - M                          ******         (**** FT)
    STACK TOP DIAMETER - M                    *******        (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                BITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG               23493.        ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                        12.50
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                   11.30
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                       .65
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %                     .01
    RANGE CHLORIDE CONTENT - %                ******
    FUEL FIRING RATE - M T/H                  *******        (*** TPH)
    FUEL FIRING RATE - MW                     *****

** ESP
    NUMBER                                      1

** MECHANICAL COLLECTOR
    NUMBER                                      1

** PARTICULATE SCRUBBER
    NUMBER                                      1
    TYPE                                      TCA
    SUPPLIER                                  UOP
    NUMBER OF STAGES                              3
    SHELL MATERIAL                            CARBON STEEL
    LINING MATERIAL                           RUBBER
    INTERNAL MATERIAL                         STAINLESS STEEL
    BOILER LOAD/SCRUBBER - %                     67.0
    FLUE GAS CAPACITY - CU.M/S                  164.4        ( 348400 ACFM)
    FLUE GAS TEMPERATURE - C                    146.1        (  295 F)
    L/G RATIO - LITER/CU.M                        7.5        (56.0 GAL/1000ACF)
    PRESSURE DROP - KPA                           3.2        (    13 IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S                3.4        (   11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M               1.8        (    .80 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M               .0        (  .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %    97.0
    SO2 INLET CONCENTRATION - PPM               500.000
    SO2 OUTLET CONCENTRATION - PPM              420.000
    SO2 DESIGN REMOVAL EFFICIENCY - %            16.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                  PUBLIC SERVICE OF COLORADO
PLANT NAME                                    CHEROKEE
UNIT NUMBER                                   3
CITY                                          DENVER
STATE                                         COLORADO
REGULATORY CLASSIFICATION                     ******
PARTICULATE EMISSION LIMITATION - NG/J          0.          (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW             710.0
GROSS UNIT GENERATING CAPACITY - MW            170.0
NET UNIT GENERATING CAPACITY W/FGD - MW        150.0
NET UNIT GENERATING CAPACITY WO/FGD - MW          .0
EQUIVALENT SCRUBBED CAPACITY - MW                 .0

** BOILER DATA
    SUPPLIER                                  BABCOCK & WILCOX
    TYPE                                      PULVERIZED COAL
    SERVICE LOAD                              ******
    COMMERCIAL SERVICE DATE                    0/62
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S     ********      (******* ACFM)
    FLUE GAS TEMPERATURE - C                  *******       (**** F)
    STACK HEIGHT - M                          ******        (**** FT)
    STACK TOP DIAMETER - M                    *******       (***** FT)

** FUEL DATA
    FUEL TYPE                                 COAL
    FUEL GRADE                                BITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG               23493.       ( 10100 BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                              ******
    AVERAGE ASH CONTENT - %                      12.50
    RANGE ASH CONTENT - %                     ******
    AVERAGE MOISTURE CONTENT - %                 11.30
    RANGE MOISTURE CONTENT - %                ******
    AVERAGE SULFUR CONTENT - %                     .65
    RANGE SULFUR CONTENT - %                  ******
    AVERAGE CHLORIDE CONTENT - %                   .01
    RANGE CHLORIDE CONTENT - %                ******
    FUEL FIRING RATE - M T/H                  *******       (*** TPH)
    FUEL FIRING RATE - MW                     *****

** ESP
    NUMBER                                      1

** MECHANICAL COLLECTOR
    NUMBER                                      1

** PARTICULATE SCRUBBER
    NUMBER                                     2
    TYPE                                      TCA
    SUPPLIER                                  UOP
    NUMBER OF STAGES                             3
    SHELL MATERIAL                            CARBON STEEL
    LINING MATERIAL                           RUBBER
    INTERNAL MATERIAL                         STAINLESS STEEL
    BOILER LOAD/SCRUBBER - %                    20.0
    FLUE GAS CAPACITY - CU.M/S                  57.6        ( 122000 ACFM)
    FLUE GAS TEMPERATURE - C                   137.8        (  280 F)
    L/G RATIO - LITER/CU.M                       7.5        (56.0 GAL/1000ACF)
    PRESSURE DROP - KPA                          3.2        (    13 IN-H2O)
    SUPERFICIAL GAS VELOCITY - M/S               3.4        (   11.0 FT/S)
    PARTICULATE INLET LOAD - G/CU.M               .9        (    .40 GR/SCF)
    PARTICULATE OUTLET LOAD - G/CU.M              .0        (   .020 GR/SCF)
    PARTICULATE DESIGN REMOVAL EFFICIENCY - %   95.0
    SO2 INLET CONCENTRATION - PPM              500.000
    SO2 OUTLET CONCENTRATION - PPM             420.000
    SO2 DESIGN REMOVAL EFFICIENCY - %           16.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

```
COMPANY NAME                                    PUBLIC SERVICE OF COLORADO
PLANT NAME                                      CHEROKEE
UNIT NUMBER                                     4
CITY                                            DENVER
STATE                                           COLORADO
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J            0.          ( .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW               710.0
GROSS UNIT GENERATING CAPACITY - MW              375.0
NET UNIT GENERATING CAPACITY W/FGD - MW          350.0
NET UNIT GENERATING CAPACITY WO/FGD - MW            .0
EQUIVALENT SCRUBBED CAPACITY - MW                   .0

** BOILER DATA
   SUPPLIER                                     COMBUSTION ENGINEERING
   TYPE                                         PULVERIZED COAL
   SERVICE LOAD                                 ******
   COMMERCIAL SERVICE DATE                      0/68
   MAXIMUM BOILER FLUE GAS FLOW - CU.M/S         717.29       (1520000 ACFM)
   FLUE GAS TEMPERATURE - C                      135.0        ( 275 F)
   STACK HEIGHT - M                             ******        (**** FT)
   STACK TOP DIAMETER - M                       *******       (***** FT)

** FUEL DATA
   FUEL TYPE                                    COAL
   FUEL GRADE                                   BITUMINOUS
   AVERAGE HEAT CONTENT - KJ/KG                  23493.       ( 10100 BTU/LB)
   RANGE HEAT CONTENT - BTU/LB                                 ******
   AVERAGE ASH CONTENT - %                         12.50
   RANGE ASH CONTENT - %                        ******
   AVERAGE MOISTURE CONTENT - %                    11.30
   RANGE MOISTURE CONTENT - %                   ******
   AVERAGE SULFUR CONTENT - %                        .65
   RANGE SULFUR CONTENT - %                     ******
   AVERAGE CHLORIDE CONTENT - %                      .01
   RANGE CHLORIDE CONTENT - %                   ******
   FUEL FIRING RATE - M T/H                     *******       (*** TPH)
   FUEL FIRING RATE - MW                        *****

** ESP
   NUMBER                                         1

** MECHANICAL COLLECTOR
   NUMBER                                         1

** PARTICULATE SCRUBBER
   NUMBER                                       4
   TYPE                                         TCA
   SUPPLIER                                     UOP
   NUMBER OF STAGES                               3
   SHELL MATERIAL                               CARBON STEEL
   LINING MATERIAL                              RUBBER
   INTERNAL MATERIAL                            STAINLESS STEEL
   L/G RATIO - LITER/CU.M                         7.5         (56.0 GAL/1000ACF)
   PRESSURE DROP - KPA                            3.2         (   13 IN-H2O)
   SUPERFICIAL GAS VELOCITY - M/S                 3.4         (   11.0 FT/S)
   PARTICULATE INLET LOAD - G/CU.M                1.6         (   .70 GR/SCF)
   PARTICULATE OUTLET LOAD - G/CU.M                .0         (  .020 GR/SCF)
   PARTICULATE DESIGN REMOVAL EFFICIENCY - %     97.0
   SO2 INLET CONCENTRATION - PPM                500.000
   SO2 OUTLET CONCENTRATION - PPM               420.000
   SO2 DESIGN REMOVAL EFFICIENCY - %             16.0
```

SECTION 14
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL PARTICULATE SCRUBBERS

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COMPANY NAME                                    PUBLIC SERVICE OF COLORADO
PLANT NAME                                      VALMONT
UNIT NUMBER                                     5
CITY                                            VALMONT
STATE                                           COLORADO
REGULATORY CLASSIFICATION                       ******
PARTICULATE EMISSION LIMITATION - NG/J              0.        (  .000 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J                  ******        (****** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW                273.8
GROSS UNIT GENERATING CAPACITY - MW               166.0
NET UNIT GENERATING CAPACITY W/FGD - MW           166.0
NET UNIT GENERATING CAPACITY WO/FGD - MW             .0
EQUIVALENT SCRUBBED CAPACITY - MW                    .0

** BOILER DATA
    SUPPLIER                                    ******
    TYPE                                        PULVERIZED COAL
    SERVICE LOAD                                BASE
    COMMERCIAL SERVICE DATE                      0/64
    MAXIMUM BOILER FLUE GAS FLOW - CU.M/S       *********     (******* ACFM)
    FLUE GAS TEMPERATURE - C                    *******       (**** F)
    STACK HEIGHT - M                            ******        (**** FT)
    STACK TOP DIAMETER - M                      *******       (***** FT)

** FUEL DATA
    FUEL TYPE                                   COAL
    FUEL GRADE                                  SUBBITUMINOUS
    AVERAGE HEAT CONTENT - KJ/KG                *******       (****** BTU/LB)
    RANGE HEAT CONTENT - BTU/LB                                ******
    AVERAGE ASH CONTENT - %                         5.20
    RANGE ASH CONTENT - %                       ******
    AVERAGE MOISTURE CONTENT - %                ********
    RANGE MOISTURE CONTENT - %                  ******
    AVERAGE SULFUR CONTENT - %                       .60
    RANGE SULFUR CONTENT - %                    ******
    AVERAGE CHLORIDE CONTENT - %                ********
    RANGE CHLORIDE CONTENT - %                  ******
    FUEL FIRING RATE - M T/H                    *******       (*** TPH)
    FUEL FIRING RATE - MW                       *****

** ESP
    TYPE                                        COLD SIDE

** MECHANICAL COLLECTOR
```

APPENDIX A

FGD SYSTEM COST DATA: OPERATIONAL AND NONOPERATIONAL SYSTEMS

INTRODUCTION

The cost of flue gas desulfurization (FGD) systems for the control of sulfur dioxide emissions is an area of intense interest and substantial controversy. As a result, many computer models have recently been developed to estimate capital and annual costs. As part of an effort by the U.S. Environmental Protection Agency to provide meaningful economic data concerning FGD systems, reported economic data have been incorporated into the EPA Utility FGD Survey report. This information has appeared as a separate appendix of the report since October 1976. Until January 1978, this cost appendix consisted entirely of data reported by the utilities with little or no interpretation provided by PEDCo Environmental, Inc. Beginning with the May 1978 report, the format and content of the cost appendix were revised to include reported and adjusted costs for the operational FGD systems.

The rationale for including adjusted as well as reported costs stems primarily from the lack of comparability of the reported costs. Many of the reported cost figures, both capital and operating, are largely site-sensitive values that cannot be accurately compared because they refer to different FGD battery limits and different years in which the expenditures were made. As a result, an analysis of the cost data was made for the operational units since these systems offer the potential of having complete and accurate economic data. The adjustments were made to provide comparable, accurate cost data for the sulfur dioxide portion of the emission control system. This, in effect, will eliminate much of the confusion that exists concerning the reported data, and it will provide a common basis for the reported costs.

APPROACH

In March 1978, each utility having at least one operational FGD system was given a cost form containing all available cost information then in the PEDCo files. The utility was asked to verify the data and fill in any missing information called for on the form. A follow-up visit by the PEDCo Environmental staff was arranged to assist in data acquisition and to insure completeness and reliability of information. Results of the cost analysis were forwarded to each participating utility for final review and comment.

The cost data were treated solely to establish the accurate costs for FGD systems, on a common basis, not to critique the design or reasonableness of the costs reported by any utility. Adjustments focused primarily on the following items:

- All capital costs were adjusted to July 1, 1977, dollars using the Chemical Engineering Index. All capital costs, represented in dollars/kilowatt ($/kW), were expressed in terms of gross megawatts (MW). Actual costs were reported by utilities in dollar values for years 1970 to 1980. These values are represented in terms of the year of greatest capital expenditures.

- Gross unit capacity was used to express all FGD capital expenditures because the capital requirement of an FGD system is dependent on actual boiler size before derating for auxiliary and air quality control power requirements.

- Particulate control costs were deducted. Since the purpose of the study was to estimate the incremental cost for sulfur dioxide control, particulate control costs were deducted using either data contained in the cost breakdowns or as a percentage of the total direct cost (capital and annual). The percentage reduction varied depending upon system design and operation.

- The capital costs associated with the modification or installation of equipment not part of the FGD system but needed for its proper functioning, were included (e.g. - stack lining, modification to existing ductwork or fans, etc.).

- Indirect charges were adjusted to provide adequate funds for engineering, field expenses, legal expenses, insurance, interest during construction, allowance for startup, taxes, and contingency.

- All annual costs, represented in mills/kilowatt-hour (mills/kWh), were expressed in terms of net megawatts (MW).

- Net unit capacity was used to express all FGD annual expenditures because the annual cost requirement of an FGD system is dependent on the actual amount of kilowatt-hours (kWh) produced by the unit after derating for auxiliary and air quality control power requirements.

- All annual costs were adjusted to a common capacity factor (65%).

- Replacement power costs were not included since only a few utilities reported such costs and these were presented using a variety of methods.

- Sludge disposal costs were adjusted to reflect the costs of sulfur dioxide waste disposal only (i.e., excluding fly ash disposal) and to provide for disposal over the anticipated lifetime of the FGD system. This latter correction was necessary since several utilities reported costs for sludge disposal capacity that would last only a fraction of the FGD system life. The adjustments were based on a land cost of $2000/acre with a sludge depth of 50 ft in a clay-lined pond (clay is assumed to be available at the site).

- A 30-year life was assumed for all process and economic considerations for all new systems that were installed for the life of the unit. A 20-year life was assumed for all process and economic considerations for retrofit systems that were installed for the remaining portion of the life of the unit.*

- Regeneration and by-product recovery facility costs were added for those regenerable systems not reporting such costs.

To the extent possible, all cost adjustments were made using the previous assumptions developed by PEDCo Environmental. When cost data were inadequate, adjustments were made using process design data in conjunction with the previous cost assumptions. In some cases, no adjustments were possible because of insufficient data.

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* The use of a 30-year service life for new units coincides with the conclusion of the National Power Survey of the Federal Power Commission which recognized this value as reasonable for steam-electric plants. A 20-year service life was assumed for all retrofit units even if the remaining life of the units is less than this value. Thus, two different rates are used and should be noted when making comparisons between new and retrofit systems.

DESCRIPTION OF COST ELEMENTS

Capital costs consist of direct costs, indirect costs, contingency costs, and other capital costs. Direct costs include the "bought-out" cost of the equipment, the cost of installation, and site development. Indirect costs include interest during construction, contractor's fees and expenses, engineering, legal expenses, taxes, insurance, allowance for start-up and shakedown, and spares. Contingency costs include those costs resulting from malfunctions, equipment alterations, and similar unforeseen sources. Other capital costs include the nondepreciable items of land and working capital.

Annual costs consist of direct costs, fixed costs, and overhead costs. Direct costs include the cost of raw materials, utilities, operating labor and supervision, and maintenance and repairs. Fixed costs include those of depreciation, interim replacement, insurance, taxes, and interest on borrowed capital. Overhead costs include those of plant and payroll expenses. The various capital and annual cost components are discussed and defined in greater detail in the following paragraphs.

The direct capital costs include the following elements:

- Equipment required for the FGD system. Table A-1 provides a summary of the major process equipment used in regenerable and nonregenerable systems.
- Installation of equipment, including foundations; steel work for support, buildings, piping and ducting for effluents, slurries, sludge, and make-up water, control panels, instrumentation, insulation of ducting, buildings, piping, and other equipment, painting and piling.
- Site development may include clearing and grading, construction of access roads and walkways, establishment of rail, barge, and/or truck facilities, and parking facilities.

TABLE A-1. MAJOR FGD SYSTEM EQUIPMENT SUMMARY

Category	Description
Material handling-raw materials	Equipment for the handling and transfer of raw materials includes unloading facilities, conveyors, storage areas and silos, vibrators, atmospheric emission control associated with these facilities, and related accessories.
Feed preparation-raw materials	Equipment for the preparation of raw material to produce a feed slurry consists of feed weighers, crushers, grinders, classifiers, ball mills, mixing tanks, pumps, agitators, and related accessories.
Sulfur dioxide absorption	Equipment for treating the flue gas includes absorbers, mist eliminators, hold tanks, agitators, circulating pumps, pond water return pumps, and related accessories.
Flue gas reheat	Equipment required includes air, steam, or hot water heaters, condensate tanks, pumps, soot blowers, fans, fuel storage facilities, gas bypass equipment, and related accessories.
Gas handling	Equipment to handle the boiler flue gas includes booster fans, ductwork, flue gas bypass system, turning vanes, supports, platforms, and related accessories.
Sludge disposal	Nonregenerable FGD systems require solids/water separation equipment such as clarifiers, vacuum filters, centrifuges, sludge fixation equipment, and related accessories.
Utilities	Equipment to supply power and water to the FGD equipment consists of switch-gear, breakers, transformers, piping, and related accessories.
By-product handling	Equipment for processing the by-product of regenerable FGD systems may include a rotary kiln, fluid bed dryer, conveyor, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boilers, hammer mills, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.

(continued)

TABLE A-1. (continued)

Category	Description
Regeneration	Equipment for regeneration of the absorbing medium of an FGD system may consist of reactor vessels, material handling system, storage, weigh feeder, conveyor, rotary kiln, fluid bed calciner, dust collector, storage silo, vibrator, combustion equipment and oil storage tanks, waste heat boiler, hammer mill, evaporators, crystallizers, strippers, tanks, agitators, pumps, compressors, sulfuric acid absorber and cooling, mist eliminator, pumps, acid coolers, tanks, etc.
Purge treatment	Equipment for the removal of purge material (e.g. sodium sulfate) includes refrigeration, pumps, tanks, crystallizer, centrifuge, dryer, dust collector, conveyors, storage, and related equipment.
Auxiliary	Equipment not directly related to the FGD system, but which may require design or modification to accommodate an FGD system may include such items as existing fans, ducts, or stack. If new fans, ducts, or stacks are added to improve boiler performance and accommodate the FGD system, the costs are prorated to the boiler and FGD system.

Indirect capital costs include the following elements:

- Interest accrued on borrowed capital during construction.
- Contractor's fee and expenses, including costs for field labor payroll; field office supervision; personnel; construction offices; temporary roadways; railroad trackage; maintenance and welding shops; parking lot; communications; temporary piping and electrical and sanitary facilities; safety security (fire, material, medical, etc.); construction tools and rental equipment; unloading and storage of materials; travel expenses; permits; licenses; taxes; insurance; overhead; legal liabilities; field testing of equipment; start-up; and labor relations.
- Engineering costs, including administrative, process, project, and general; design and related functions for specifications; bid analysis; special studies; cost analysis; accounting; reports; consultant fees; purchasing; procurement; travel expenses; living expenses; expediting; inspection; safety; communications; modeling; pilot plant studies (if required because of process design or application novelty); royalty payments during construction; training of plant personnel; field engineering; safety engineering; and consultant services.
- Legal expenses, including those for securing permits, rights-of-way, etc.
- Taxes, including sales, and excise taxes.
- Insurance covering liability for equipment in transit and at site; fire, casualty, injury, and death; damage to property; delay; and noncompliance.
- Allowance for start-up and shakedown includes the cost associated with system start-up.
- Spare parts including pumps, valves, controls, special piping and fittings, instruments, spray nozzles, and similar items.

Other capital costs include the following elements:

- Land required for the FGD process, waste disposal, regeneration facility, and storage.
- Working capital, including the total amount of money invested in raw materials and supplies in stock, finished products in stock, and unfinished products

in the process of being manufactured; accounts receivable; cash kept on hand for payment of operating expenses such as salaries, wages, and raw materials purchases; accounts payable; and taxes payable.

Annual cost of an FGD system includes the following direct, fixed and overhead charges:

- Direct Charges
  - Raw materials, including those required by the FGD process for sulfur dioxide control, absorbent regeneration, sludge treatment, sludge fixation, flocculants, etc.
  - Utilities, including water for slurries, cooling and cleaning; electricity for pumps, fans, valves, lighting controls, conveyors, and mixers; fuel for reheating of flue gases; and stream for processing.
  - Operating labor, including supervisory, skilled, and unskilled labor required to operate, monitor, and control the FGD process.
  - Maintenance and repairs, consisting of both manpower and materials to keep the unit operating efficiently. The function of maintenance is both preventive and corrective to keep outages to a minimum.
  - Byproduct Sales: credit from the sale of byproducts regenerable FGD processes (e.g. sulfur, sulfuric acid) is a negative charge deducted from the annual direct cost to obtain the net annual direct cost of the FGD system.
- Fixed Charges
  - Depreciation - the annual charge to recover direct and indirect costs of physical assets over the life of the asset.
  - Interim, replacement - costs expended for temporary or provisional replacement of equipment that has failed or malfunctioned prematurely.
  - Insurance, including the costs of protection from loss by a specified contingency, peril, or unforeseen event. Required coverage could include losses due to fire, personal injury or death, property damage, explosion, lightning, or other natural phenomena.

  - Taxes, including franchise, excise, and property taxes levied by a city, county, state, or Federal government.
  - Interest on borrowed funds.

- Overhead

  Plant and administrative overhead is a business expense that is not charged directly to a particular part of a project, but is allocated to it. Overhead costs include administrative, safety, engineering, legal and medical services; payroll; employee benefits; recreation; and public relations.

Table A-2 provides a summary of the means used to determine the missing cost elements if the costs were not reported or insufficient information prevented their actual determination. The assumptions and cost bases for determining the capital and annual costs of FGD systems were developed by the PEDCo staff based upon previous economic studies conducted for the U.S. EPA (Flue Gas Desulfurization Process Cost Assessment, May 1975; Simplified Procedures for Estimating Flue Gas Desulfurization System Costs, June 1976, EPA-600/2-76-150; Particulate and Sulfur Dioxide Emission Control Costs for Large Coal-Fired Boilers, March 1978, EPA-600/7-78-032).

TABLE A-2. COST ELEMENT FACTORS

Category	Value
Indirect capital costs:	
Interest during construction	10% of total direct capital costs
Field overhead	10% of total direct capital costs
Contractor's fee and expenses	5% of total direct capital costs
Engineering	10% of total direct capital costs
Taxes	2% of total direct capital costs
Spares	1% of total direct capital costs
Shakedown allowance	5% of total direct capital costs
Other capital costs:	
Contingency[a]	20% of total direct and indirect capital costs
Direct annual costs:	
Raw materials:	
Fixation chemicals	\$2/ton
Lime	\$40/ton
Limestone	\$10/ton
Magnesium oxide	\$150/ton
Sodium carbonate	\$80/ton
Salt cake (credit)	\$50/ton
Sulfur (credit)	\$65/ton
Sulfuric acid (credit)	\$25/ton
Utilities:	
Electricity	25 mills/kWh
Water	$\$0.20/10^3$ gal
Steam	$\$0.80/10^6$ Btu
Operating labor:	
Direct labor	\$8.50/man-hour
Supervision	15% of direct labor costs

[a] Contingency costs are used only when the cost data supplied are incomplete (such as equipment costs or direct costs only) and a contingency cost must be factored in to give an accurate estimate of the total capital cost.

(continued)

TABLE A-2. (continued)

Category	Value
Maintenance:	
Labor and materials	4% of total direct capital costs
Supplies	15% of labor and materials costs
Overhead:	
Plant	50% of operation and maintenance costs
Payroll	20% of operating labor costs
Fixed annual costs:	
Depreciation	3.33% or 5% (new or retrofit)
Interim replacement[b]	0.7% or 0.35%
Taxes	4%
Insurance	0.3%
Capital costs	9%

[b] Some system components have life spans less than the expected service life of the system. Interim replacement is an allowance factor used in estimating annual revenue requirements to provide for the replacement of these short-lived items. An average allowance of 0.35% of the total investment is normally provided and used for systems with an expected service life of 20 years or less. A higher allowance of 0.70% of the total investment is provided and used for systems with an expected service life of 30 years or more.

DEFINITION OF COST ELEMENTS

The costs displayed in Appendix A are accompanied by a series of alphabetic characters summarizing data presented for each FGD system. These relate to the cost elements described earlier in this section and identify what has been included and excluded for reported and adjusted capital and annual costs. The alphabetic characters, along with their titles, are briefly described in Table A-3.

TABLE A-3. DESCRIPTION OF COST

Code	Title	Description
A	Particulate control (required for FGD process) included in capital cost.	Particulate precollection device (ESP, fabric filter, venturi) prior to FGD system required for proper operation of SO_2 control system.
B	Particulate control (included in FGD process) included in capital cost.	Particulate collection equipment (venturi scrubber) is included in the FGD system.
C	Total direct capital costs included.	Complete cost of all FGD equipment, the labor and materials required for equipment installation, and interconnecting the system is included in the total capital cost.
D	Partial direct capital costs included.	One or a number of direct cost items, or the cost associated with one or a number of direct cost items, are excluded from the total capital cost.
E	Total indirect capital costs included.	Complete cost of all the indirect cost elements, including interest during construction, contractor's fees, engineering, legal expenses, taxes, insurance, allowance for start-up, and spares, is included in total capital cost.
F	Partial indirect costs included.	One or a number of indirect cost items, or the cost associated with one or a number of indirect cost items, are excluded from the total capital cost.
G	Chemical fixation of sludge included in capital cost.	The cost of a chemical fixation process which stabilizes the flue gas cleaning wastes prior to disposal is included in the total capital cost.
H	Dry sludge disposal included in capital cost.	The cost of a secondary dewatering or treatment method, such as filtration, centrifugation, or forced oxidation, which ultimately produces a dry sludge cake for final disposal, is included in the total capital cost.
I	Off-site landfill area included in capital cost.	The cost of an off-site area used as a landfill for flue gas cleaning wastes is included in the total capital cost.
J	Sludge pond included in capital cost.	The cost of an on-site disposal area for ponding of treated or untreated flue gas cleaning wastes is included in the total capital cost.
K	Additional sludge disposal capacity added for life of system.	The cost of additional SO_2 waste disposal capacity required for FGD system operation over the anticipated service life of the unit is included in the total capital cost.
L	Stack included in capital cost.	The cost of the stack is included in the total capital cost.
M	Modifications to stack, ducts, and/or fans included in capital cost.	Modifications to existing equipment (stack, fans, ducts, etc.) which are required because of inclusion of an FGD system.
N	Total regeneration facility cost included in capital cost.	Complete cost of entire regeneration facility included in total capital cost.
O	Partial regeneration facility cost included in capital cost.	Part of the cost associated with the regeneration facility included in the total capital cost.
P	R & D costs included in capital cost.	Bench scale or pilot plant studies to determine process and design characteristics.

(continued)

TABLE A-3. (continued)

Code	Title	Description
Q	Costs underwritten by system supplier included in capital cost.	Capital expenditures underwritten by the system supplier for system repairs or modifications for optimization of performance or R & D programs.
R	Excess reagent supply costs included in capital cost.	Capital expenditures for reagent supply exceeds the amount required for the period of initial operation.
S	Total direct annual costs included.	Complete cost of all raw materials, utilities, operating labor and maintenance and repairs is included in the total annual cost.
T	Partial direct annual costs included.	One or a number of direct annual cost items, or the cost associated with one or a number of direct annual cost items, are excluded from the total annual cost.
U	Total fixed annual costs included.	Complete cost of all fixed cost elements, including depreciation, interim replacement, insurance, taxes, and interest, is included in the total annual cost.
V	Partial fixed annual costs included.	One or a number of fixed annual cost items, or the cost associated with one or a number of fixed annual cost items, are excluded from the total annual cost.
W	Overhead cost included in total annual cost.	Plant and payroll overhead costs are included in the total annual cost.
X	Particulate control costs included in direct annual cost.	The cost of operating particulate collection equipment included in the FGD system is included in the total annual cost.
Y	Sludge disposal service costs (contract) included in direct annual cost.	The treatment and disposal of flue gas cleaning wastes that are handled by an outside firm.
Z	Replacement energy costs included in total annual costs.	The cost of additional power-generating capacity required to compensate for power used by the FGD system.

RESULTS OF COST ANALYSIS

The results of the operational FGD system survey are summarized in Table A-4 and Section A-1. Table A-4 produces a summary of a categorical analysis of the reported and adjusted capital and annual costs for the operational FGD systems addressed in the survey. Included in this categorical analysis are the ranges, means, and standard deviation for all the various types and categories of FGD systems examined. Section A-1 summarizes the reported and adjusted capital and annual costs for all the operational FGD systems addressed in the survey (Section A-2 summarizes available cost data for nonoperational FGD systems).

In an attempt to further clarify and allow additional comparison of costs between different FGD units, the adjusted fixed annual costs were standardized. This was done by taking the adjusted Total Direct and Indirect Capital Costs for each unit and applying the identical rate for costs of depreciation, interim replacement, taxes, insurance and capital. These new sums were totaled, then added to the adjusted Variable Cost to determine the Total Standardized Annual Costs. In this manner costs can be compared based upon the assumption that Utilities can incur Fixed Annual Costs at the same rate.

TABLE A-4. CATEGORICAL RESULTS OF THE REPORTED AND ADJUSTED CAPITAL AND ANNUAL COSTS FOR OPERATIONAL FGD SYSTEMS

CATEGORY	REPORTED						ADJUSTED					
	CAPITAL, $/KW			ANNUAL, MILLS/KWH			CAPITAL, $/KW			ANNUAL, MILLS/KWH		
	RANGE	AVG	DEV	RANGE	AVG	DEV	RANGE	AVG	DEV	RANGE	AVG	DEV
ALL	5.3-156.9	77.0	36.9	.3- 14.9	6.3	5.1	60.9-233.2	94.2	35.2	2.7- 12.4	5.5	2.4
NEW	5.3-120.6	71.4	30.0	.3- 14.3	4.6	5.0	66.4-117.6	85.5	16.9	2.8- 8.7	5.2	2.0
RETROFIT	29.2-156.9	83.7	42.7	2.1- 14.9	8.3	4.4	60.9-233.2	103.6	45.8	2.7- 12.4	5.8	2.6
THROWAWAY PRODUCT	5.3-120.6	67.1	29.2	.3- 14.3	5.9	4.9	60.9-140.6	87.0	21.2	2.7- 8.7	5.2	1.9
SALEABLE PRODUCT	93.3-156.9	132.5	23.5	3.3- 14.9	9.1	5.8	134.8-233.2	184.0	49.2	12.4- 12.4	12.4	.0
LIMESTONE	5.3- 99.5	61.4	27.6	1.6- 3.3	2.2	.8	66.4-117.6	93.1	21.9	2.9- 6.6	5.0	1.4
LIME	29.2-120.6	74.1	29.7	.3- 14.3	9.0	4.5	67.5-140.6	88.9	21.1	2.7- 8.7	6.0	2.0
LIME/ALKALINE FLYASH	85.9- 85.9	85.9	.0	*****- .0	.0	.0	93.0- 93.0	93.0	.0	5.2- 5.2	5.2	.0
SODIUM CARBONATE	42.9-113.6	66.5	33.3	2.1- 2.1	2.1	.0	60.9-107.9	76.6	22.2	3.2- 4.4	3.6	.6
WELLMAN LORD	127.9-156.9	137.6	13.7	14.9- 14.9	14.9	.0	134.8-134.8	134.8	.0	12.4- 12.4	12.4	.0
LIMESTONE/ALKALINE FLYASH	47.9- 47.9	47.9	.0	2.0- 2.0	2.0	.0	71.5- 71.5	71.5	.0	2.8- 2.8	2.8	.0
MAGNESIUM OXIDE	156.7-156.7	156.7	.0	*****- .0	.0	.0	233.2-233.2	233.2	.0	*****- .0	.0	.0

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

		COST		
UNIT DESCRIPTION	COST DESCRIPTION	REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
ALABAMA ELECTRIC COOP	CAPACITY FACTOR, %	***	65	65
TOMBIGBEE	TOTAL CAPITAL, $/KW(YEAR)	172.5(1978)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
179.0 MW (NET)	COST ELEMENTS	A,D		
ARIZONA ELECTRIC POWER COOP	CAPACITY FACTOR, %	44	65	65
APACHE	TOTAL CAPITAL, $/KW(YEAR)	35.9(1977)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1978)	******(0)	******(0)
195.0 MW (NET)	COST ELEMENTS	C,E,H,J,L,S, U,W,Y,Z		
CENTRAL ILLINOIS LIGHT	CAPACITY FACTOR, %	***	65	65
DUCK CREEK	TOTAL CAPITAL, $/KW(YEAR)	93.3(1978)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.3(1976)	******(0)	******(0)
416.0 MW (NET)	COST ELEMENTS	C,E,J,M		
COLUMBUS & SOUTHERN OHIO ELEC.	CAPACITY FACTOR, %	48	65	65
CONESVILLE	TOTAL CAPITAL, $/KW(YEAR)	55.5(1975)	70.7(1977)	70.7(1977)
5	TOTAL ANNUAL, MILLS/KWH(YEAR)	5.8(1975)	7.4(1977)	7.4(1977)
411.0 MW (NET)	COST ELEMENTS	B,C,J,M,S,U, W,X,Y	C,E,J,M,S,U, W,Y	C,E,J,M,S,U, W,Y
COLUMBUS & SOUTHERN OHIO ELEC.	CAPACITY FACTOR, %	48	65	65
CONESVILLE	TOTAL CAPITAL, $/KW(YEAR)	55.5(1978)	70.7(1977)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	5.8(1978)	******(0)	******(0)
411.0 MW (NET)	COST ELEMENTS	B,C,J,M,S,U, W,X,Y	C,E,J,M,S,U, W,Y	
DUQUESNE LIGHT	CAPACITY FACTOR, %	64	65	65
ELRAMA	TOTAL CAPITAL, $/KW(YEAR)	113.4(1976)	127.1(1977)	127.1(1977)
1-4	TOTAL ANNUAL, MILLS/KWH(YEAR)	6.6(1977)	7.8(1977)	7.5(1977)
510.0 MW (NET)	COST ELEMENTS	B,D,F,I,J,M, T,V,X,Y	C,E,I,J,M,S, U,Y	C,E,I,J,M,S, U,Y
DUQUESNE LIGHT	CAPACITY FACTOR, %	70	65	65
PHILLIPS	TOTAL CAPITAL, $/KW(YEAR)	106.9(1972)	140.6(1977)	140.6(1977)
1-6	TOTAL ANNUAL, MILLS/KWH(YEAR)	7.8(1977)	8.6(1977)	8.2(1977)
410.0 MW (NET)	COST ELEMENTS	B,D,F,I,J,M, T,V,X,Y	C,E,I,J,M,S, U,Y	C,E,I,J,M,S, U,Y
INDIANAPOLIS POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
PETERSBURG	TOTAL CAPITAL, $/KW(YEAR)	99.5(1976)	100.6(1977)	100.6(1977)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	6.6(1977)	7.4(1977)
532.0 MW (NET)	COST ELEMENTS	C,F,G,J,M	C,E,G,J,M,S, U,W,Y	C,E,G,J,M,S, U,W,Y
KANSAS CITY POWER & LIGHT	CAPACITY FACTOR, %	14	65	65
HAWTHORN	TOTAL CAPITAL, $/KW(YEAR)	29.2(1972)	87.2(1977)	87.2(1977)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	8.4(1977)	4.3(1977)	4.4(1977)
90.0 MW (NET)	COST ELEMENTS	B,D,F,T,X	B,C,E,J,K,S, U,W,X	B,C,E,J,K,S, U,W,X
KANSAS CITY POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
HAWTHORN	TOTAL CAPITAL, $/KW(YEAR)	29.2(1972)	87.2(1977)	87.2(1977)
4	TOTAL ANNUAL, MILLS/KWH(YEAR)	8.4(1977)	4.3(1977)	4.4(1977)
90.0 MW (NET)	COST ELEMENTS	B,D,F,T,X	B,C,E,J,K,S, U,W,X	B,C,E,J,K,S, U,W,X

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST		
		REPORTED	ADJUSTED	STANDARDIZED ADJUSTED
KANSAS CITY POWER & LIGHT	CAPACITY FACTOR, %	42	65	65
LA CYGNE	TOTAL CAPITAL, $/KW(YEAR)	53.6(1972)	68.0(1977)	68.0(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	1.3(1978)	3.8(1977)	3.9(1977)
874.0 MW (NET)	COST ELEMENTS	T	C,E,J,K,S,U	C,E,J,K,S,U
KENTUCKY UTILITIES	CAPACITY FACTOR, %	16	65	65
GREEN RIVER	TOTAL CAPITAL, $/KW(YEAR)	70.3(1975)	77.5(1977)	77.5(1977)
1-3	TOTAL ANNUAL, MILLS/KWH(YEAR)	14.3(1977)	2.7(1977)	5.2(1977)
64.0 MW (NET)	COST ELEMENTS	B,C,E,J,S,U,W	C,E,J,S,U,W	C,E,J,S,U,W
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	55	65	65
CANE RUN	TOTAL CAPITAL, $/KW(YEAR)	66.5(1975)	80.6(1977)	80.6(1977)
4	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(1977)	5.8(1977)	6.2(1977)
186.0 MW (NET)	COST ELEMENTS	C,E,H,J,Q,T	C,E,H,J,K,Q,S,U,W	C,E,H,J,K,Q,S,U,W
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	***	65	65
CANE RUN	TOTAL CAPITAL, $/KW(YEAR)	62.4(1977)	67.5(1977)	67.5(1977)
5	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	5.6(1977)	5.6(1977)
190.0 MW (NET)	COST ELEMENTS	C,E,H,J	C,E,H,J,K,S,U,W	C,E,H,J,K,S,U,W
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	***	65	65
CANE RUN	TOTAL CAPITAL, $/KW(YEAR)	57.9(1977)	******(0)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.2(1979)	******(0)	******(0)
288.0 MW (NET)	COST ELEMENTS	C,E,H,M,S,V,W		
LOUISVILLE GAS & ELECTRIC	CAPACITY FACTOR, %	***	65	65
PADDY'S RUN	TOTAL CAPITAL, $/KW(YEAR)	52.8(1973)	76.4(1977)	76.4(1977)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	6.5(1977)	6.4(1977)
72.0 MW (NET)	COST ELEMENTS	C,E	C,E,S,U,W	C,E,S,U,W
MINNKOTA POWER COOPERATIVE	CAPACITY FACTOR, %	***	65	65
MILTON R. YOUNG	TOTAL CAPITAL, $/KW(YEAR)	85.9(1976)	93.0(1977)	93.0(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	5.2(1977)	5.2(1977)
405.0 MW (NET)	COST ELEMENTS	C,E,H,P	C,E,H,M,P,S,U,W	C,E,H,M,P,S,U,W
MONTANA POWER	CAPACITY FACTOR, %	76	65	65
COLSTRIP	TOTAL CAPITAL, $/KW(YEAR)	77.1(1975)	77.2(1977)	77.2(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(1977)	4.1(1977)	4.0(1977)
360.0 MW (NET)	COST ELEMENTS	B,C,E,J,P,T	C,E,J,K,P,S,U,W	C,E,J,K,P,S,U,W
MONTANA POWER	CAPACITY FACTOR, %	76	65	65
COLSTRIP	TOTAL CAPITAL, $/KW(YEAR)	77.1(1975)	77.2(1977)	77.2(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	.3(1977)	4.1(1977)	4.1(1977)
360.0 MW (NET)	COST ELEMENTS	B,C,E,J,P,T	C,E,J,K,P,S,U,W	C,E,J,K,P,S,U,W
NEVADA POWER	CAPACITY FACTOR, %	67	65	65
REID GARDNER	TOTAL CAPITAL, $/KW(YEAR)	42.9(1973)	60.9(1977)	60.9(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1977)	3.2(1977)	3.4(1977)
125.0 MW (NET)	COST ELEMENTS	B,D,E,P,S,U,W,X	B,D,E,P,S,U,W,X	B,D,E,P,S,U,W,X

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
NEVADA POWER	CAPACITY FACTOR, %	67	65	65
REID GARDNER	TOTAL CAPITAL, $/KW(YEAR)	42.9(1973)	60.9(1977)	60.9(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1977)	3.2(1977)	3.4(1977)
125.0 MW (NET)	COST ELEMENTS	B,D,E,P,S,U, W,X	B,D,E,P,S,U, W,X	B,D,E,P,S,U, W,X
NEVADA POWER	CAPACITY FACTOR, %	67	65	65
REID GARDNER	TOTAL CAPITAL, $/KW(YEAR)	113.6(1975)	107.9(1977)	107.9(1977)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1977)	4.4(1977)	5.0(1977)
125.0 MW (NET)	COST ELEMENTS	B,C,E,L,S,U, W,X	B,C,E,L,S,U, W,X	B,C,E,L,S,U, W,X
NORTHERN INDIANA PUB SERVICE	CAPACITY FACTOR, %	77	65	65
DEAN H. MITCHELL	TOTAL CAPITAL, $/KW(YEAR)	156.9(1976)	134.8(1977)	134.8(1977)
11	TOTAL ANNUAL, MILLS/KWH(YEAR)	14.9(1976)	12.4(1977)	11.0(1977)
115.0 MW (NET)	COST ELEMENTS	B,C,E,L,N,S, U,W,X,Z	C,E,L,N,S,U, W,Z	C,E,L,N,S,U, W,Z
NORTHERN STATES POWER	CAPACITY FACTOR, %	73	65	65
SHERBURNE	TOTAL CAPITAL, $/KW(YEAR)	47.9(1972)	71.5(1977)	71.5(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.0(1977)	2.8(1977)	3.3(1977)
740.0 MW (NET)	COST ELEMENTS	B,C,J,S,U,X, Z	C,E,J,K,S,U, W	C,E,J,K,S,U, W
NORTHERN STATES POWER	CAPACITY FACTOR, %	73	65	65
SHERBURNE	TOTAL CAPITAL, $/KW(YEAR)	47.9(1972)	71.5(1977)	71.5(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.0(1977)	2.8(1977)	3.3(1977)
740.0 MW (NET)	COST ELEMENTS	B,C,J,S,U,X, Z	C,E,J,K,S,U, W	C,E,J,K,S,U, W
PENNSYLVANIA POWER	CAPACITY FACTOR, %	40	65	65
BRUCE MANSFIELD	TOTAL CAPITAL, $/KW(YEAR)	120.6(1975)	102.1(1977)	102.1(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	14.3(1977)	8.7(1977)	10.8(1977)
917.0 MW (NET)	COST ELEMENTS	B,C,E,G,I,L, S,U,W,X	C,E,G,I,M,S, U,W	C,E,G,I,M,S, U,W
PENNSYLVANIA POWER	CAPACITY FACTOR, %	40	65	65
BRUCE MANSFIELD	TOTAL CAPITAL, $/KW(YEAR)	120.6(1975)	102.1(1977)	102.1(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	14.3(1977)	8.7(1977)	10.8(1977)
917.0 MW (NET)	COST ELEMENTS	B,C,E,G,I,L, S,U,W,X	C,E,G,I,M,S, U,W	C,E,G,I,M,S, U,W
PHILADELPHIA ELECTRIC	CAPACITY FACTOR, %	***	65	65
EDDYSTONE	TOTAL CAPITAL, $/KW(YEAR)	156.7(1972)	233.2(1977)	233.2(1977)
1A	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(1972)	******(1977)	******(1977)
120.0 MW (NET)	COST ELEMENTS	D,F,N,P	C,E,N,P	C,E,N,P
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	TOTAL CAPITAL, $/KW(YEAR)	127.9(1977)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
361.0 MW (NET)	COST ELEMENTS	A,C,E,N		
PUBLIC SERVICE OF NEW MEXICO	CAPACITY FACTOR, %	***	65	65
SAN JUAN	TOTAL CAPITAL, $/KW(YEAR)	127.9(1977)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
350.0 MW (NET)	COST ELEMENTS	A,C,E,N		

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-1
COSTS FOR OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
SOUTH CAROLINA PUBLIC SERVICE	CAPACITY FACTOR, %	80	65	65
WINYAH	TOTAL CAPITAL, $/KW(YEAR)	47.4(1976)	66.4(1977)	6.4(1977)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	1.6(0)	2.9(1977)	3.2(1977)
140.0 MW (NET)	COST ELEMENTS	C,F,J,M,S,V	C,E,J,K,M,S, U,W	C,E,J,K,M,S, U,W
SOUTHERN INDIANA GAS & ELEC	CAPACITY FACTOR, %	***	65	65
A.B. BROWN	TOTAL CAPITAL, $/KW(YEAR)	43.2(1979)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
265.0 MW (NET)	COST ELEMENTS	C,E,G		
SOUTHERN MISSISSIPPI ELECTRIC	CAPACITY FACTOR, %	***	65	65
R.D. MORROW	TOTAL CAPITAL, $/KW(YEAR)	232.5(1978)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
124.0 MW (NET)	COST ELEMENTS	D		
SPRINGFIELD CITY UTILITIES	CAPACITY FACTOR, %	***	65	65
SOUTHWEST	TOTAL CAPITAL, $/KW(YEAR)	77.3(1974)	117.6(1977)	117.6(1977)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	6.2(1977)	6.9(1977)
194.0 MW (NET)	COST ELEMENTS	C,F,H,J,P	C,E,H,J,K,P, S,U,W	C,E,H,J,K,P, S,U,W
TENNESSEE VALLEY AUTHORITY	CAPACITY FACTOR, %	60	65	65
WIDOWS CREEK	TOTAL CAPITAL, $/KW(YEAR)	98.1(1976)	113.1(1977)	113.1(1977)
8	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.0(1977)	5.3(1977)	5.1(1977)
550.0 MW (NET)	COST ELEMENTS	B,C,E,P,R,T, U	C,E,J,S,U,W	C,E,J,S,U,W

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2

COSTS FOR NON-OPERATIONAL FGD SYSTEMS

UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	 ADJUSTED	 STANDARDIZED ADJUSTED
ALABAMA ELECTRIC COOP	CAPACITY FACTOR, %	***	65	65
TOMBIGBEE	TOTAL CAPITAL, $/KW(YEAR)	69.5(1978)	******(0)	******(0)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
179.0 MW (NET)	COST ELEMENTS	C,E,J		
ARIZONA ELECTRIC POWER COOP	CAPACITY FACTOR, %	44	65	65
APACHE	TOTAL CAPITAL, $/KW(YEAR)	31.8(7700)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	2.1(1975)	******(0)	******(0)
195.0 MW (NET)	COST ELEMENTS	C,E,H,J,L,S, U,W,Y,Z		
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
LARAMIE RIVER	TOTAL CAPITAL, $/KW(YEAR)	68.2(1980)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
600.0 MW (NET)	COST ELEMENTS	C,E		
BASIN ELECTRIC POWER COOP	CAPACITY FACTOR, %	***	65	65
LARAMIE RIVER	TOTAL CAPITAL, $/KW(YEAR)	68.2(1980)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
600.0 MW (NET)	COST ELEMENTS	C,E		
BIG RIVERS ELECTRIC	CAPACITY FACTOR, %	***	65	65
GREEN	TOTAL CAPITAL, $/KW(YEAR)	43.2(1976)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
242.0 MW (NET)	COST ELEMENTS	B,C		
BOSTON EDISON	CAPACITY FACTOR, %	***	65	65
MYSTIC	TOTAL CAPITAL, $/KW(YEAR)	63.4(1972)	******(0)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	3.0(1974)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	B,C,E,N,Q		
CENTRAL ILLINOIS PUBLIC SERV	CAPACITY FACTOR, %	***	65	65
NEWTON	TOTAL CAPITAL, $/KW(YEAR)	189.0(1979)	******(0)	******(0)
	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
617.0 MW (NET)	COST ELEMENTS	C,E,G		
COLORADO UTE ELECTRIC ASSN.	CAPACITY FACTOR, %	***	65	65
CRAIG	TOTAL CAPITAL, $/KW(YEAR)	117.0(1979)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
447.0 MW (NET)	COST ELEMENTS	B,D,E		
COLORADO UTE ELECTRIC ASSN.	CAPACITY FACTOR, %	***	65	65
CRAIG	TOTAL CAPITAL, $/KW(YEAR)	117.0(1979)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
447.0 MW (NET)	COST ELEMENTS	A,C		
COMMONWEALTH EDISON	CAPACITY FACTOR, %	***	65	65
POWERTON	TOTAL CAPITAL, $/KW(YEAR)	117.7(1979)	******(0)	******(0)
51	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
450.0 MW (NET)	COST ELEMENTS	C,E,H,J		

****** INDICATES COST FIGURES NOT YET AVAILABLE

SECTION A-2
COSTS FOR NON-OPERATIONAL FGD SYSTEMS

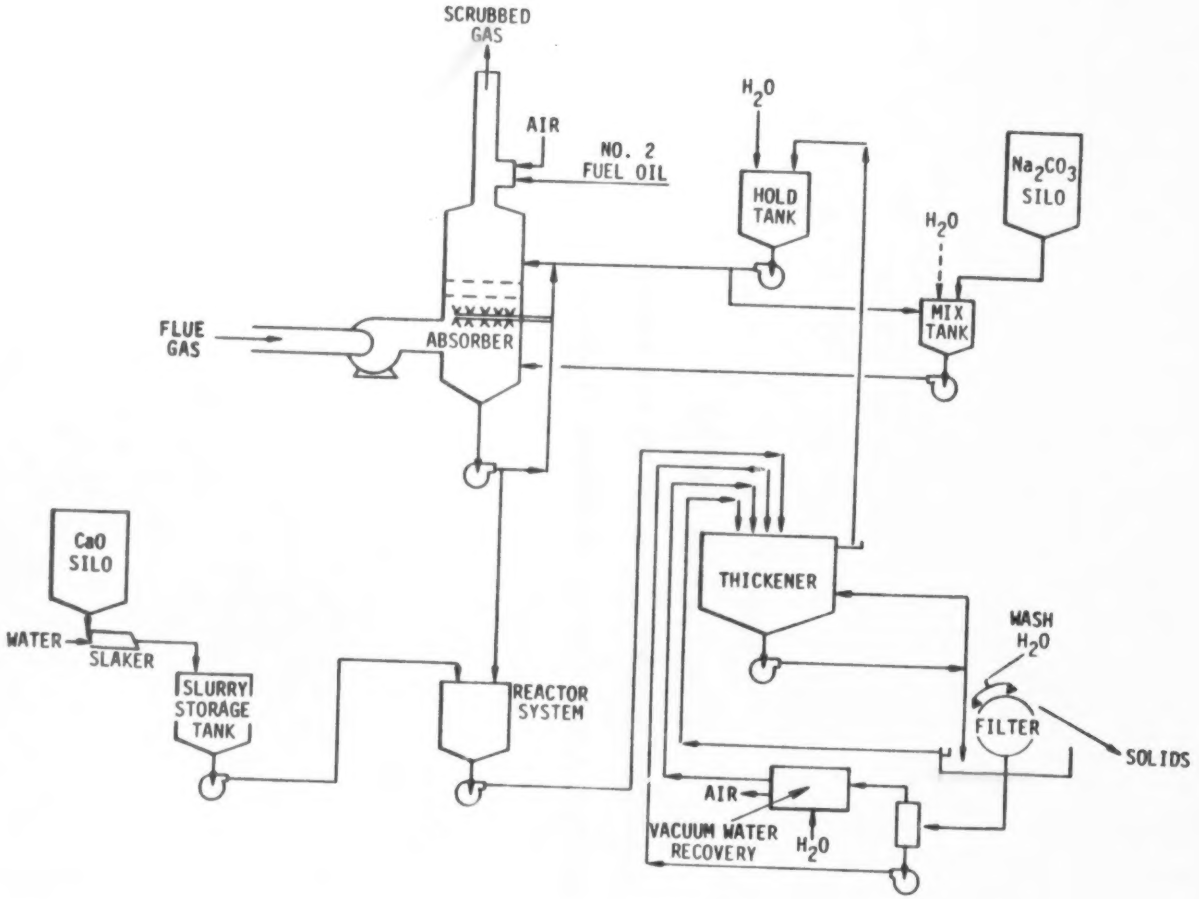
UNIT DESCRIPTION	COST DESCRIPTION	COST REPORTED	COST ADJUSTED	COST STANDARDIZED ADJUSTED
COMMONWEALTH EDISON	CAPACITY FACTOR, %	49	65	65
WILL COUNTY	TOTAL CAPITAL, $/KW(YEAR)	113.0(1972)	******(0)	******(0)
1	TOTAL ANNUAL, MILLS/KWH(YEAR)	13.1(1975)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	B,C,E,G,J,X		
DETROIT EDISON	CAPACITY FACTOR, %	***	65	65
ST. CLAIR	TOTAL CAPITAL, $/KW(YEAR)	80.3(1976)	******(0)	******(0)
6	TOTAL ANNUAL, MILLS/KWH(YEAR)	9.6(1976)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	B,C,E,J,M,X		
ILLINOIS POWER COMPANY	CAPACITY FACTOR, %	***	65	65
WOOD RIVER	TOTAL CAPITAL, $/KW(YEAR)	82.5(1972)	******(0)	******(0)
4	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	A,C,E,M,N		
PACIFIC POWER & LIGHT	CAPACITY FACTOR, %	***	65	65
JIM BRIDGER	TOTAL CAPITAL, $/KW(YEAR)	120.0(1979)	******(0)	******(0)
4	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
550.0 MW (NET)	COST ELEMENTS	C,E,J		
POTOMAC ELECTRIC POWER	CAPACITY FACTOR, %	***	65	65
DICKERSON	TOTAL CAPITAL, $/KW(YEAR)	68.0(1978)	******(0)	******(0)
3	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	A,C,E,M		
PUBLIC SERVICE OF COLORADO	CAPACITY FACTOR, %	***	65	65
VALMONT	TOTAL CAPITAL, $/KW(YEAR)	87.0(1974)	******(0)	******(0)
5	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
.0 MW (NET)	COST ELEMENTS	B,C,E,J		
SALT RIVER PROJECT	CAPACITY FACTOR, %	***	65	65
CORONADO	TOTAL CAPITAL, $/KW(YEAR)	98.0(1978)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
280.0 MW (NET)	COST ELEMENTS	C,E		
SOUTHERN MISSISSIPPI ELECTRIC	CAPACITY FACTOR, %	***	65	65
R.D. MORROW	TOTAL CAPITAL, $/KW(YEAR)	232.5(1978)	******(0)	******(0)
2	TOTAL ANNUAL, MILLS/KWH(YEAR)	******(0)	******(0)	******(0)
124.0 MW (NET)	COST ELEMENTS	D		

****** INDICATES COST FIGURES NOT YET AVAILABLE

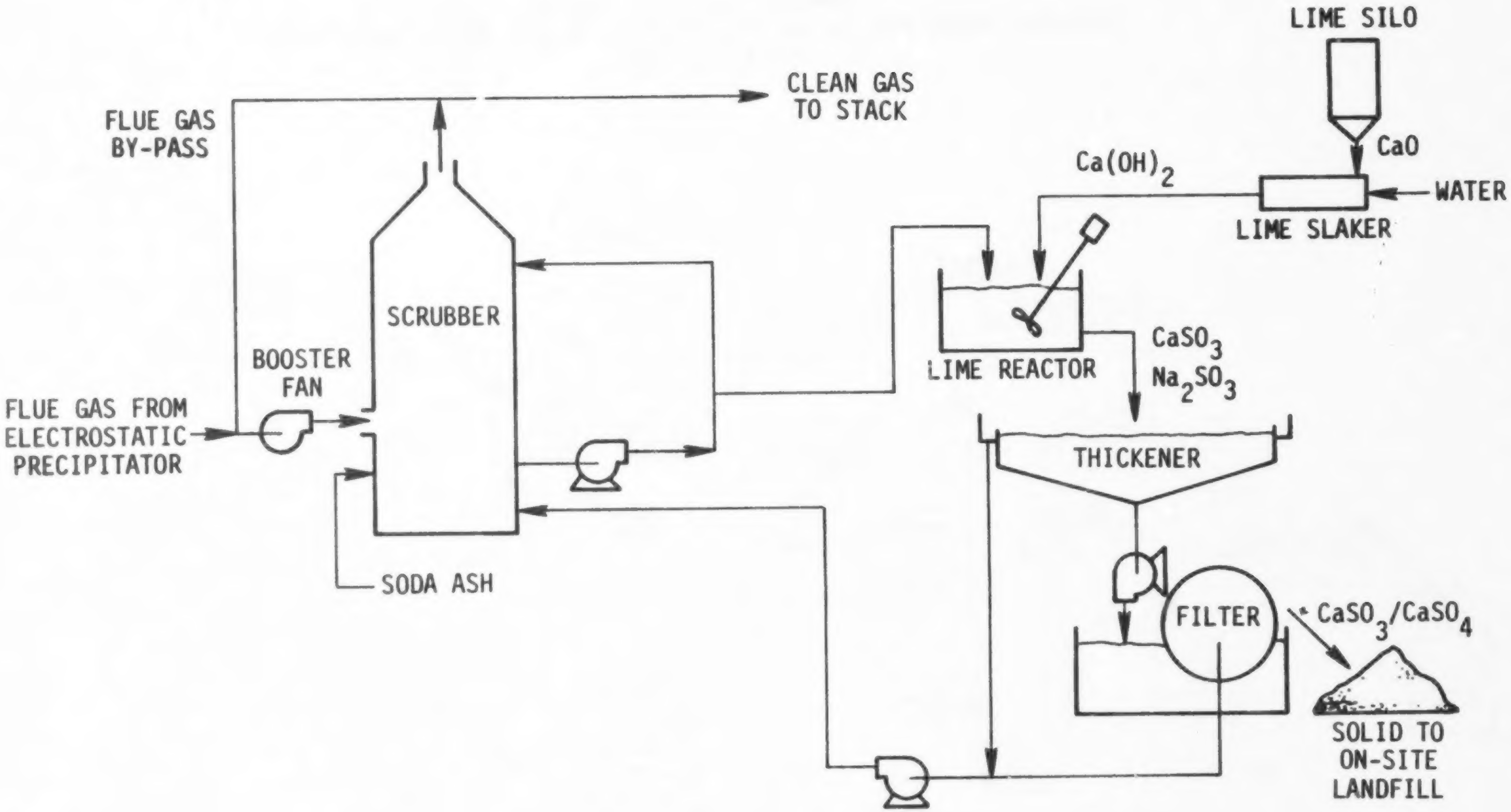
APPENDIX B

FGD PROCESS FLOW DIAGRAMS

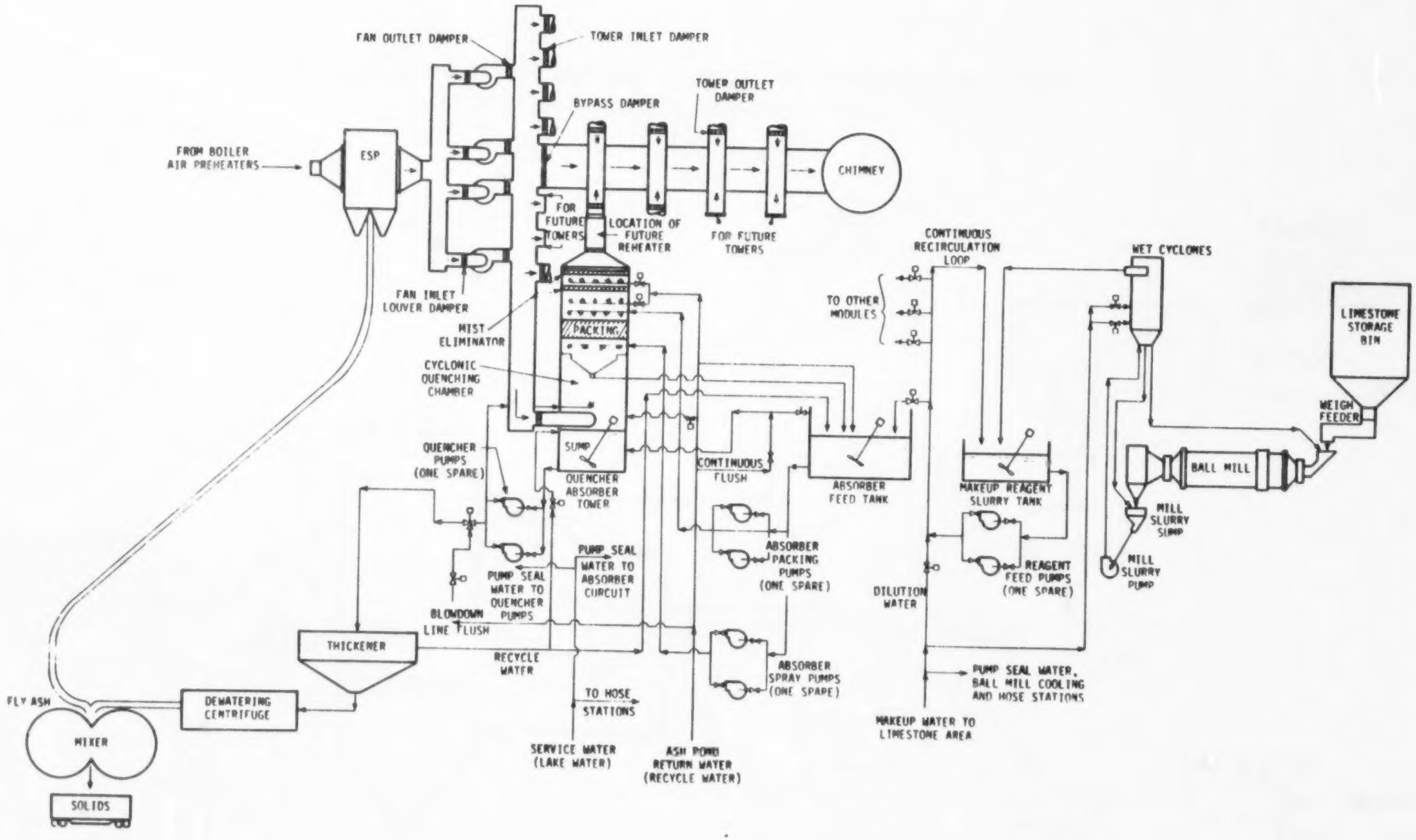
THIS APPENDIX COMPRISES OPERATING FGD SYSTEMS
ARRANGED ALPHABETICALLY ACCORDING TO UTILITY


SCRUBBED GAS
AIR
NO. 2 FUEL OIL
H_2O
HOLD TANK
Na_2CO_3 SILO
H_2O
MIX TANK
FLUE GAS
ABSORBER
CaO SILO
WATER
SLAKER
SLURRY STORAGE TANK
REACTOR SYSTEM
THICKENER
WASH H_2O
FILTER
SOLIDS
AIR
VACUUM WATER RECOVERY
H_2O

Louisville Gas and Electric, Cane Run 6
Dual Alkali FGD System: Simplified Process Flow Diagram


LIME SILO
CaO
WATER
LIME SLAKER
Ca(OH)$_2$
CLEAN GAS TO STACK
FLUE GAS BY-PASS
SCRUBBER
BOOSTER FAN
FLUE GAS FROM ELECTROSTATIC PRECIPITATOR
SODA ASH
LIME REACTOR
CaSO$_3$
Na$_2$SO$_3$
THICKENER
FILTER
CaSO$_3$/CaSO$_4$
SOLID TO ON-SITE LANDFILL

Southern Mississippi Electric, A.B. Brown 1
Dual Alkali FGD System: Simplified Process Flow Diagram


FROM BOILER AIR PREHEATERS
ESP
FAN OUTLET DAMPER
FAN INLET LOUVER DAMPER
TOWER INLET DAMPER
BYPASS DAMPER
TOWER OUTLET DAMPER
CHIMNEY
FOR FUTURE TOWERS
LOCATION OF FUTURE REHEATER
FOR FUTURE TOWERS
MIST ELIMINATOR
PACKING
CYCLONIC QUENCHING CHAMBER
SUMP
QUENCHER ABSORBER TOWER
QUENCHER PUMPS (ONE SPARE)
PUMP SEAL WATER TO QUENCHER PUMPS
PUMP SEAL WATER TO ABSORBER CIRCUIT
BLOWDOWN
LINE FLUSH
RECYCLE WATER
TO HOSE STATIONS
SERVICE WATER (LAKE WATER)
ASH POND RETURN WATER (RECYCLE WATER)
CONTINUOUS FLUSH
ABSORBER PACKING PUMPS (ONE SPARE)
ABSORBER SPRAY PUMPS (ONE SPARE)
ABSORBER FEED TANK
TO OTHER MODULES
CONTINUOUS RECIRCULATION LOOP
DILUTION WATER
MAKEUP REAGENT SLURRY TANK
REAGENT FEED PUMPS (ONE SPARE)
PUMP SEAL WATER, BALL MILL COOLING AND HOSE STATIONS
MAKEUP WATER TO LIMESTONE AREA
WET CYCLONES
LIMESTONE STORAGE BIN
WEIGH FEEDER
BALL MILL
MILL SLURRY SUMP
MILL SLURRY PUMP
THICKENER
DEWATERING CENTRIFUGE
FLY ASH
MIXER
SOLIDS

Texas Utilities,
Simplified Process Flow Diagram for One of the Three Identical
Martin Lake FGD Systems

APPENDIX C

DEFINITIONS

DEFINITIONS

Boiler Capacity Factor:	(kWh generation in year)/maximum continuous generating capacity in kW x 8760 hr/yr).
Boiler Utilization Parameters:	Hours boiler operated/hours in period, expressed as a percentage.
Byproduct	The nature (e.g. elemental sulfur, sulfuric acid) and disposition (e.g. stockpile on site, marketed) of the end product produced by systems that generate a saleable product.
Disposal	Disposal method for throwaway product systems producing sludge including: stabilized or unstabilized sludge, interim and final disposal sites and disposal type (minefill, landfill, etc.) as well as disposal location.
Efficiency:	
Particulate Matter	The actual percentage of particulate matter removed by the emission control system (mechanical collectors, ESP, or fabric filter and FGD) from the untreated flue gas.
SO_2	The actual percentage of SO_2 removed from the flue gas by the FGD system. Design removal efficiency values are presented for nonoperational systems for which actual removal data are not available.
FGD Viability Indexes	Several parameters have been developed to quantify the viability of FGD system technology. Various terms such as "availability," "reliability," "operability," and "utilization" are used to accurately

represent the operation of any FGD system during a given period. The above-mentioned parameters are defined below and discussed briefly. The objectives of this discussion are to make the reader aware that several different definitions are being used and to select appropriate parameters that can be used for reporting purposes so that reasonably consistent comparisons can be made.

Availability Index	Hours the FGD system is available for operation (whether operated or not) divided by hours in period, expressed as a percentage. This parameter tends to overestimate the viability of the FGD system because it does not penalize for election not to operate the system when it could have been operated. Boiler downtime may tend to increase the magnitude of the parameter because FGD failures generally cannot occur during such periods.
Reliability Index	Hours the FGD system was operated divided by the hours the FGD system was called upon to operate, expressed as a percentage. This parameter has been developed in order not to penalize the FGD system for elected outages, e.g., periods when the FGD system could have been run but was not run because of chemical shortages, lack of manpower, short duration boiler operations, etc. The main problem in using this formula is the concise determination whether or not the system was "called upon to operate" during a given time period. In addition, an undefined value can

	result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Operability Index	Hours the FGD system was operated divided by boiler operating hours in period, expressed as a percentage. This parameter indicates the degree to which the FGD system is actually used, relative to boiler operating time. The parameter is penalized when options are exercised not to use the FGD system in periods when the system is operable. In addition, an undefined value can result when the FGD system is not called upon to operate for a given period (e.g., turbine or boiler outage when FGD system is available).
FGD Utilization Index	Hours that the FGD system operated divided by total hours in period. This parameter is a relative stress factor for the FGD system. It is not a complete measure of FGD system viability because the parameter can be strongly influenced by conditions that are external to the FGD system (e.g., infrequent boiler operation will lower the value of the parameter although the FGD system may be highly dependable in its particular application).
End Product	
Saleable	The SO_2 removed from the flue gas is recovered in a usable or marketable form (e.g., sulfur, sulfuric acid, gypsum, ammonium sulfate, sodium sulfate).

Throwaway	The SO_2 removed from the flue gas is not recovered in a usable or marketable form and resulting sulfur-bearing waste products must be disposed in an environmentally acceptable fashion.
Energy Consumption, %	The percentage of gross unit electrical generating capacity consumed by the FGD system, as defined by the following equation: [Net MW w/o FGD - Net MW w/FGD]/ Gross unit rating]
Equivalent Scrubbed Capacity (ESC)	The effective scrubbed flue gas in equivalent MW based on the percent of flue gas scrubbed by the FGD system.
FGD Status:	
Category 1	Operational - FGD system is in service removing SO_2.
Category 2	Under Construction - ground has been broken for installation of FGD system, but FGD system has not become operational.
Category 3	Planned, Contract Awarded - contract has been signed for purchase of FGD system but ground has not been broken for installation.
Category 4	Planned, Letter of Intent Signed - letter of intent has been signed, but legal contract for purchase has not been awarded.
Category 5	Planned, Requesting/Evaluating Bids - bid requests have been released but no letter of intent or contract has been issued.
Category 6	Considering only FGD Systems - an FGD system is proposed as a means to meet an SO_2 regulation.

Category 7	Considering an FGD system as well as alternative methods.
Category 8	Nonoperational - FGD system has been operated in the past but has been shut down permanently or for an extended indefinite period of time.
FGD Vendor	A firm that fabricates and supplies flue gas desulfurization systems.
Fuel Characteristics	Type of fuel, average gross heating value in Btu/lb. average percent ash and average percent sulfur content for fuel as fired.
General Process Type	The manner in which the SO_2 from the flue gas is collected, e.g. wet scrubbing, spray drying, dry adsorption.
New	FGD unit and boiler were designed at the same time or space for addition of an FGD unit was reserved when boiler was constructed.
Process Additives	A chemical compound or element which is added to the process or normally found with the main process reagent in small quantities (e.g. Mg, adipic acid) to promote improved process operation (e.g. scale reduction, increased SO_2 removal efficiency).
Process Type	Company name if process is patented. Generic name if several companies have similar processes (e.g., Lime, Limestone, Wellman Lord, Thoroughbred 121).

Regulatory Class	A. New boiler constructed subject to Federal New Source Performance Standards (NSPS), 8/17/71. B. Existing boiler subject to State Standard that is more stringent than the NSPS, 8/17/71. C. Existing boiler subject to State Standard that is equal to or less stringent than NSPS, 8/17/71. D. Other (unknown, undetermined).
Retrofit	FGD unit will be/was added to an existing boiler not specifically designed to accommodate FGD unit.
Start-up Date	Date when initial SO_2 removal began or is scheduled to begin.
Total Controlled Capacity [TCC]	The gross rating (MW) of a unit brought into compliance with FGD, regardless of the percent of flue gas treated at the facility. In the case of prototype and demonstration FGD systems, this figure will be identical to the Equivalent Scrubbed Capacity rather than the gross unit rating if the system is not meant to bring the facility into compliance with SO_2 emission standards.
Total FGD System Lost Generation Factor	The total monthly lost generation hours due to FGD train outages divided by the total monthly expected generation if the FGD trains would have been available for operation, expressed as a percentage.
Unit Location	City and State listed in mailing address.

Unit Name	Unit identification as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - or as indicated by utility representative for installations in planning stages.
Unit Rating	
Gross	Operational - Maximum continuous gross generation capacity in MW; Preoperational - maximum continuous design generation capacity in MW.
Net w/FGD	Gross unit rating less the energy required to operate ancillary station equipment, inclusive of emission control systems.
Net w/o FGD	Gross unit rating less the energy required to operate ancillary station equipment, exclusive of emission control systems.
Utility Name	Name of corporation as it appears in Electrical World - Directory of Electrical Utilities, McGraw-Hill - Current Edition - as space permits.
Water Make-Up	Gallons per minute of make-up water required per MW of capacity.

APPENDIX D

TABLE OF UNIT NOTATION

TABLE OF UNIT NOTATION

Classification	English Unit	Symbol	Survey Report Notation	ASTM/SI Unit	Symbol	Survey Report Notation
Area	Acre	acre	ACRE	Square meter	M^2	SQ.M
	Square foot	ft^2	SQ.FT	Square meter	M^2	SQ.M
Concentration	Grains per standard cubic foot	gr/scf	GR/SCF	Grams per cubic meter	g/m^3	G/CU.M
	Parts per million	ppm	PPM	Parts per million	ppm	PPM
	Pounds per million Btu	$lb/10^6$ Btu	LB/MMBTU	Nanograms per joule	ng/J	NG/J
Flow	Actual cubic feet per minute	ft^3/min (actual)	ACFM	Cubic meters per second	m^3/s	CU.M/S
	Gallons per minute	gal/min	GPM	Liters per second	liter/s	LITER/S
	Pounds per minute	lb/min	LB/MIN	Kilogram per second	kg/s	KG/S
	Ton per day	t/day	TPD	Metric ton per day	M t/d	M T/D
	Ton per hour	t/h	TPH	Metric ton per hour	M t/h	M T/H
Heat Content	Btu per pound	Btu/lb	BTU/LB	Kilojoule per kilogram	kJ/kg	KJ/KG
Length	Foot	ft	FT	Meter	m	M
	Inch	in	IN	Centimeter	cm	CM
	Mile	mi	MI	Kilometer	km	KM
L/G Ratio	Gallons per thousand actual cubic feet	gal/1000 ft^3 (actual)	GAL/1000ACF	Liters per cubic meter	$liter/m^3$	LITER/CU.M
Mass/Weight	Pound	lb	LB	Kilogram	kg	KG
	Ton	t	T	Megagram	Mg	MG
Pressure	Inches of water	in. H_2O	IN. H_2O	Kilopascal	kPa	KPA
Temperature	Degree Fahrenheit	°F	F	Degree Celsius	°C	C
Volume	Cubic feet	ft^3	CU.F	Cubic meter	m^3	CU.M
	Acre-feet	Acre-ft	ACRE-FT	Cubic meter	m^3	CU.M